

Trouble-shooting instructions : ALF-5007

BOSCH system : L-Jetronic

Make of vehicle : ALFA-ROMEO

Basic microcard : KFZ-00..

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SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following vehicle models:

- ALFA ROMEO 75 2.5 V6 Milano USA 02.86->
- ALFA ROMEO 90 2.5 V6 Iniezione
AUS, CH, D, USA 02.86->
- ALFA ROMEO 75 3.0 V6 Iniezione USA 10.86->
- ALFA ROMEO GTV 6 3.0 Iniezione USA 10.86->
- with 2.492 l / 6-cyl. engine or
2.959 l / 6-cyl engine

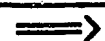
- * L-Jetronic with 35-pin control unit:
0 280 001 132 or 0 280 001 134.
- * Engine-speed triggering by term. 1 of ignition coil.
- * 7-pin air-flow sensor with pump contact.
- * 13-pin relay set.
- * 2.5 Ω solenoid-operated injection valves,
control unit with current-controlled output stage.
- * Starting enrichment by means of cold-start valve
and thermo-time switch.
- * Pressure sensor for altitude compensation.
- * Lambda closed-loop control with heated sensor.
- * No test lead from term. 22 to engine compartment
for integrator voltage measurement.
- * Testing of lambda closed-loop control via CO
measurement before the catalytic converter.
If required, use Alpha adapter C 20051.
- * 3-way catalytic converter.
- * For testing the fuel pressure, connect pressure
tester with 3-way line KDJE-P 100/13
to cold-start valve.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

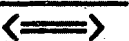
Adapter lead: 1 684 463 129

Test step	switch		Terminals	Testing of component/function	Test instructions / Test conditions	Set values
	V	Ω				
1	3	—	4 — 5 (+) (—)	Voltage from ignition and starting switch term. 50	Shift into neutral, start engine	8...15 V
2	4	—	34 — 5 (+) (—)	Voltage from relay set term. 88c via auxiliary-air device	Shift into neutral, start engine	8...15 V
3	5	—	1 — 5 (+) (—)	Voltage pulses from ignition coil term. 1	Shift into neutral, start engine	Ignition pulses on oscilloscope
4	6	—	10 — 5 (+) (—)	Voltage from relay set term. 88a	Switch on ignition	8...15 V
5	7	—	15 — 5 (+) (—)	Voltage of injection valve 1	Switch on ignition	8...15 V
6	8	—	33 — 5 (+) (—)	Voltage of injection valve 2	Switch on ignition	8...15 V
7	9	—	32 — 5 (+) (—)	Voltage of injection valve 3	Switch on ignition	8...15 V
8	10	—	14 — 5 (+) (—)	Voltage of injection valve 4	Switch on ignition	8...15 V
9	11	—	20 — 5 (+) (—)	Voltage over pump contact in air-flow sensor from relay set term. 86b	Switch on ignition Deflect sensor flap	8...15 V

A05



A06



RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (Continued)

Adapter lead: 1 684 463 129

Test step	switch		Term- inals	Testing of component/function	Test instructions / Test conditions	Set values
	V	Ω				
10	12	—	29 — 5 (+) (—)	Voltage from relay set term. 88b	Switch on ignition	8...15 V
11	13	—	30 — 5 (+) (—)	Voltage of injection valve 5	Switch on ignition	8...15 V
12	14	—	31 — 5 (+) (—)	Voltage of injection valve 6	Switch on ignition	8...15 V
13	 V	6	7 — 5	Resistance value of potentiometer wiper in air-flow sensor	Deflect air-flow sensor flap as far as it will go	80...600 Ω
14	 V	7	8 — 5	Resistance value of potentiometer (total) in air-flow sensor		260...520 Ω
15	 V	8	9 — 5	Resistance value of both resistors in series in air-flow sensor	Disconnect 3-pin cable connector from pressure sensor (altitude sensor).	400...800 Ω
16	 V	9	2 — 18	Resistance value of idle contact	Connect cable connector on to pressure sensor. Disconnect EI control-unit plug. Accelerator pedal in idle position: Slightly depress accelerator pedal:	0...10 Ω infinity Ω
17	 V	10	3 — 18	Resistance value of full-load contact	EI control-unit plug remains disconnected. Accelerator pedal in idle position: Depress accelerator pedal to floor.	infinity Ω 0...10 Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (Continued)
 Adapter lead: 1 684 463 129

Test step	switch	Ω	Terminals	Testing of component/function	Test instructions / Test conditions	Set values
18	 V	11	27 - 5	Resistance, temperature sensor (air intake)	+15...30 °C :	1.45...3.3 k Ω
19	 V	12	13 - 5	Resistance, temperature sensor (engine)	+15...30 °C : approx. +80 °C :	1.3...3.6 k Ω 250...390 Ω
20	 V	13	16 - 5	Frame connection of output stage		0...10 Ω
21	 V	14	17 - 5	Frame connection of output stage		0...10 Ω
22	 V	15	35 - 5	Frame connection of output stage		0...10 Ω
23	 V	8	9 - 5	Resistance value of pressure sensor	Disconnect 7-pin cable connector from air-flow sensor.	2.3...2.8 k Ω
24	 V	19	12 - 5	Resistance value of pressure sensor, wiper	at 977 mbar (approx. 300 m altitude): at 616 mbar (approx. 4000 m altitude): After measuring, reconnect 7-pin cable connector to air-flow sensor.	2.0...2.5 k Ω 2.2...2.7 k Ω

REMARK: Following components with corresponding connecting leads are not covered by the universal test adapter when testing:

- | | | |
|--------------------------|--|--|
| 1. Electric fuel pump/n: | Positive lead from term. 88d of relay set, | negative lead to vehicle ground. |
| 2. Sensor heater: | Positive lead from term. 88c of relay set, | negative lead to engine ground. |
| 3. Lambda sensor: | Sensor lead to ctrl. unit term.24 (shielding at term. 23), | sensor housing to vehicle ground. |
| 4. Cold-start valve: | Positive lead from term. 86 of relay set, | neg. lead to thermo-time switch term. W. |
| 5. Thermo-time switch: | At term. G pos from term. 86 of relay combination, | thermo-time switch housing to eng. ground. |

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Fuel delivery at return	
2.5l-engine:	at least 800 cm ³ /30 s.
3.0l-engine:	at least 900 cm ³ /30 s.
* Supply voltage under load:	at least 12 V
In-tank pre-supply pump (if fitted)	
* Fuel delivery	
2.5l-engine:	at least 900 cm ³ /30 s.
3.0l-engine:	at least 1000 cm ³ /30 s.
Pressure regulator	
* Fuel pressure:	
with engine at standstill:	2,3 ... 2,7 bar
at idle:	approx. 0.5 bar lower
Fuel system, leakages	
* Fuel pressure after 20 mins. with engine at standstill:	at least 1.0 bar
Temperature sensor (air intake) at air-flow sensor at term. 6 and term. 27	
* Internal electrical resistance at ambient temperature +15...+30°C :	1,45...3,3 k Ω
Temperature sensor (engine)	
* Internal electrical resistance at ambient temperature +15...+30°C :	1,3 ... 3,6 k Ω
With eng. at norm op. temp. approx. +80°C :	250 ... 390 Ω

TEST SPECIFICATIONS (Continued)

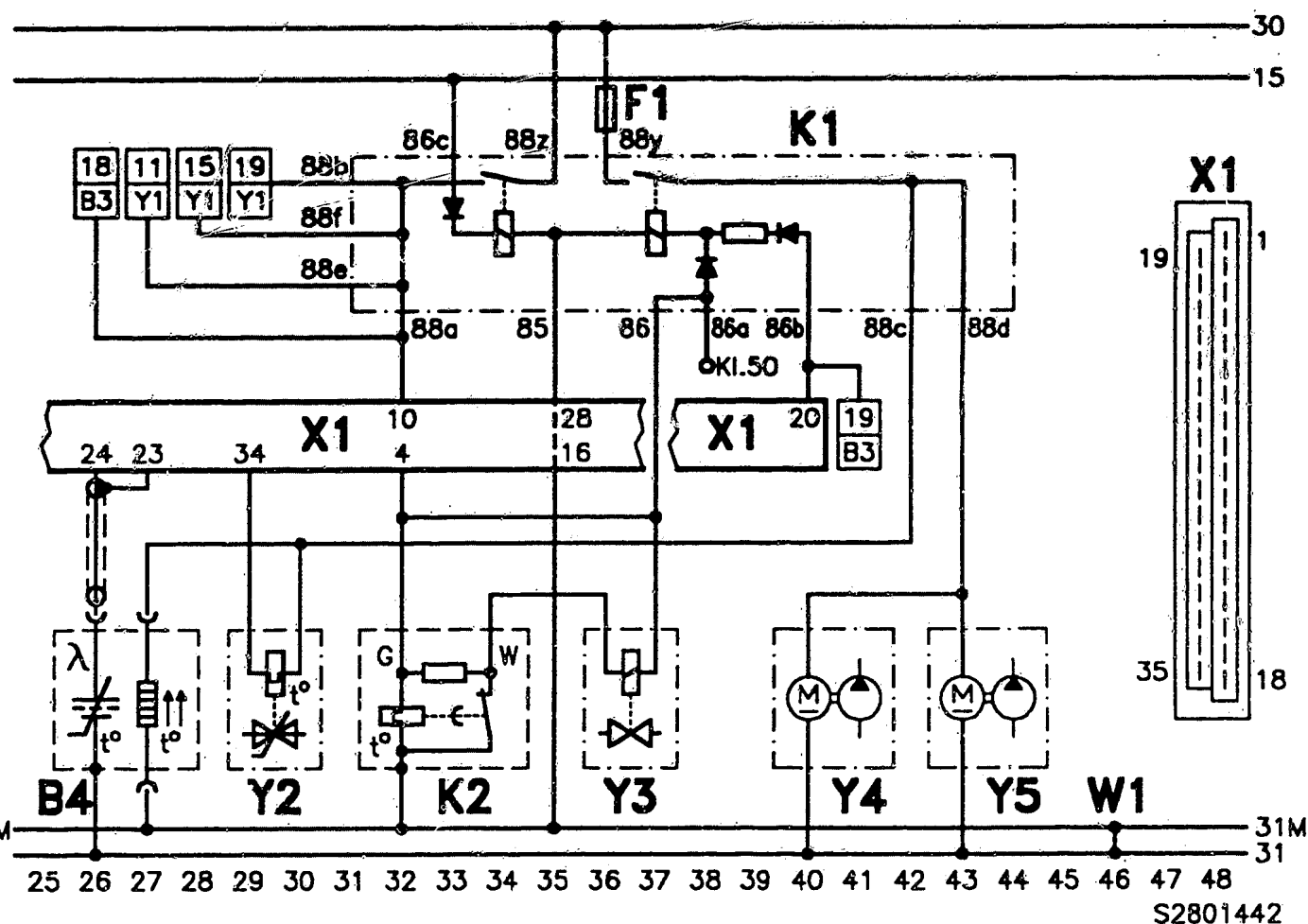
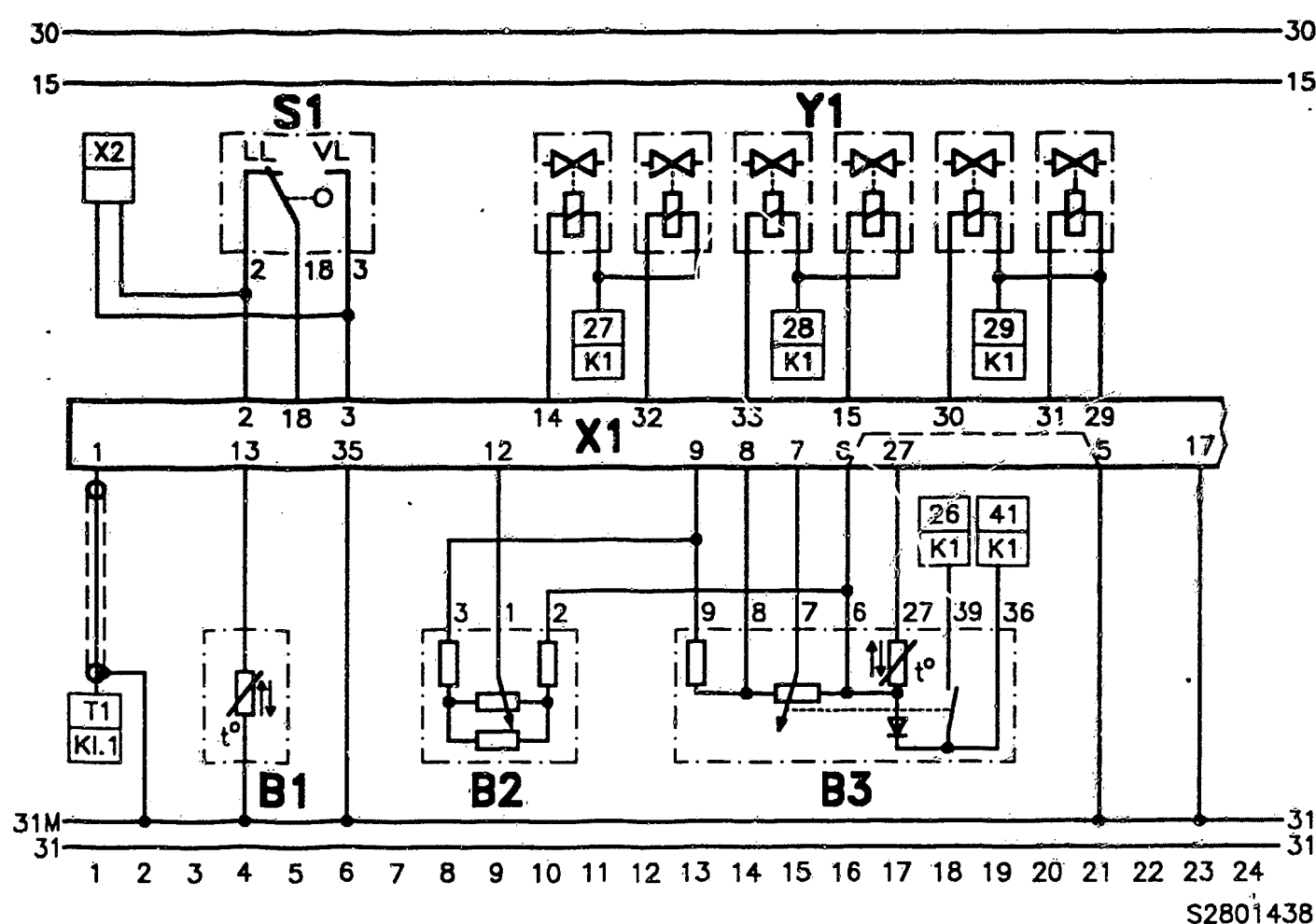
Component/function	Set values
Auxiliary-air device	
* Internal electrical resistance:	25...60 Ω
Air-flow sensor	
* Resistance between	
term. 6 and term. 9:	400...800 Ω
term. 6 and term. 8:	260...520 Ω
term. 6 and term. 7:	
(Fully deflect air-flow sensor flap)	80...600 Ω
term. 7 and term. 8:	200...1000 Ω
term. 8 and term. 9:	140...280 Ω
Solenoid-operated injection valve	
* Internal electrical resistance at ambient temperature +15...+30°C:	2,0...3,0 Ω
* Leakage after 60 s:	no drop must fall
Pressure sensor (altitude sensor)	
* 300 m altitude (977mbar):	2,0...4,0 V
4000m altitude (616mbar):	8,0...12,0 V
Resistance between	
term. 2 (-) and term. 3 (+):	2,3...2,8 k Ω
Relay set	
* Electrical resistance between term. 85 and term. 86b:	70...500 Ω

TEST SPECIFICATIONS (Continued)

Component/function	Set values	
Thermo-time switch 35° / 8 s		
* Internal electrical resistance between:	below +30°C	above +40°C
Terminal G and ground:	25... 40 Ω	50... 80 Ω
Terminal W and ground:	0 Ω	100...160 Ω
Terminal G and terminal W:	25... 40 Ω	50... 80 Ω
Cold-start valve		
* Internal electrical resistance:	3,5...4,5 Ω	
* Leakage, maximum permissible:	1 drops/min.	
Lambda-sensor heater		
* Internal electrical resistance (PTC) with engine at standstill:	1...15 Ω	
Idle adjustment		
* Idle speed	Manual and automatic transmission: 800...1000 min ⁻¹	
* CO content:	0,5...0,7 % by vol.	
Measuring location before catalytic converter.		
Pull apart lambda-sensor plug and disconnect tank-ventilation hose.		
If required, use Alfa Romeo Adapter C 20051.		
Connect sensor plug:	engine speed and CO must remain unchanged.	

TEST SPECIFICATIONS (CONTINUED)

Component/function	Set values
Lambda closed-loop control	
Allow engine at operating temperature to idle. Detach tank-ventilation hose. Measure CO-content ahead of catalytic converter.	
* Rich value	CO-content
Disconnect Lambda sensor plug and connect control-unit end to ground:	increases to above 0,7 vol. %
Only perform measurement briefly.	
* Lean value	
Apply 2 V to control-unit end of sensor lead:	drops below 0,5 vol %
	Engine does not run smoothly
* Closed-loop control value	
Connect sensor plug. Attach tank-ventilation hose:	0,4...0,8 vol %
Detach intake-manifold pressure actuator (air hose) at pressure regulator:	briefly increases and drops back to closed-loop control value above
Switch off suction plant during exhaust-emission measurement and adjustment.	
See equipment and Autodata microcards for settings as regards ignition, valve clearance and other engine-related data.	

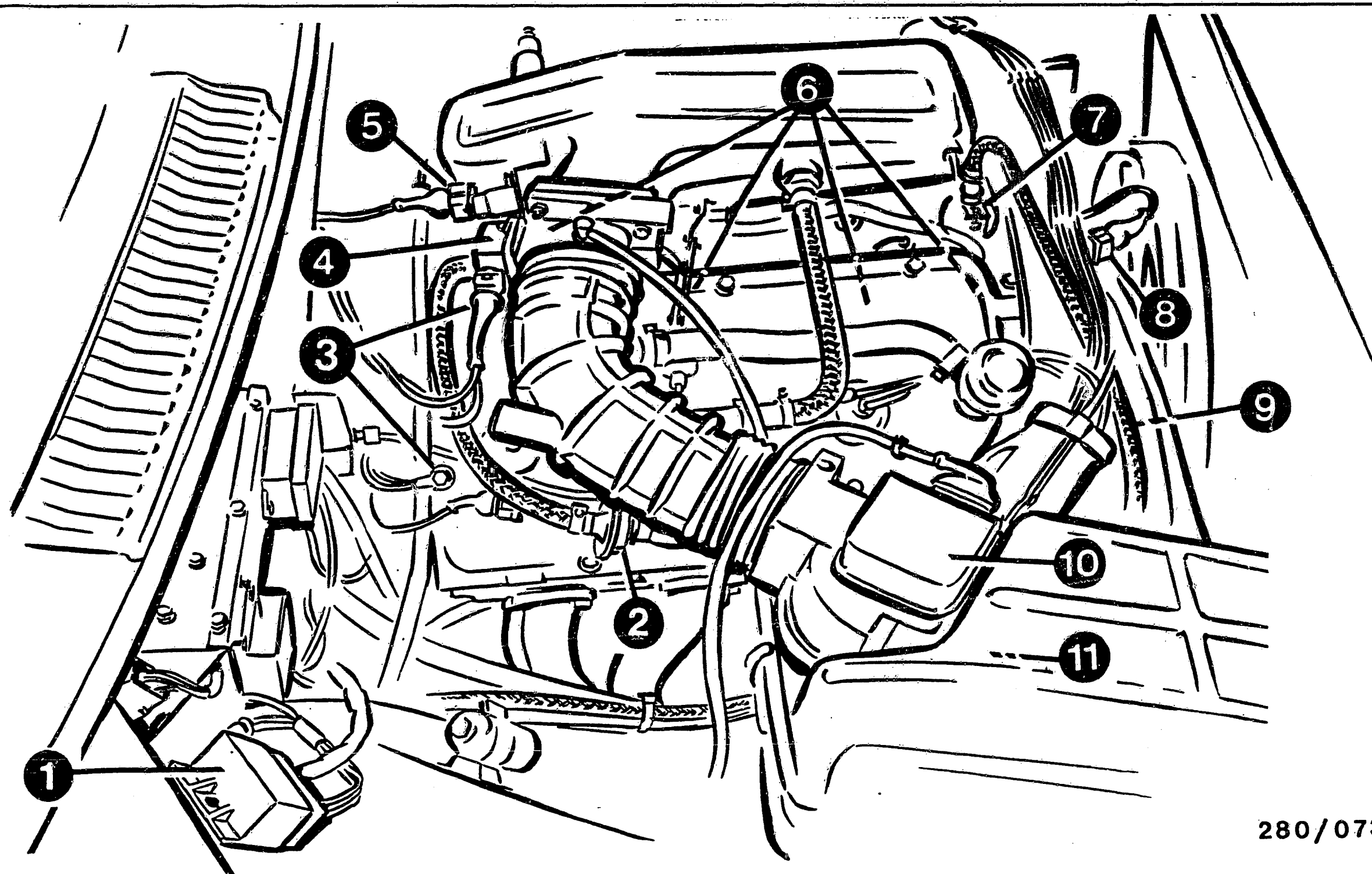


ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (engine)
B2 = Pressure sensor (altitude sensor)
B3 = Air-flow sensor with
pump contact
B4 = Heated lambda sensor
F1 = Pump fuse

K1 = Relay combination
K2 = Thermo-time switch
S1 = Throttle-valve switch
T1 = Ignition coil
W1 = Engine ground strap
X1 = Control-unit plug

X2 = Ignition-control-unit plug
Y1 = Solenoid-operated injection valves
Y2 = Auxiliary-air device
Y3 = Start valve
Y4 = Electric fuel pump
Y5 = In-tank pre-supply pump



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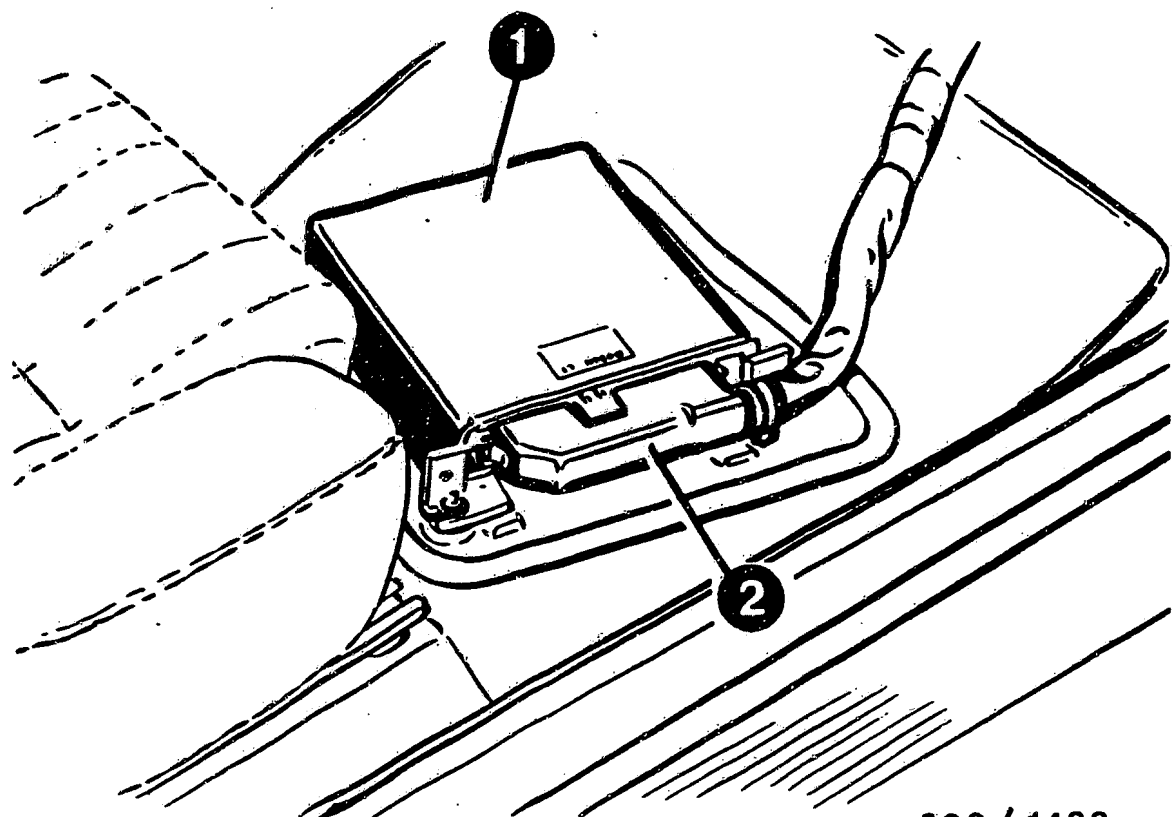
- 1 = Relay set
- 2 = Auxiliary-air device
- 3 = Central ground in GTV,
at auxiliary-air device in 75

- 4 = Throttle-valve switch
- 5 = Cold-start valve
- 6 = Solenoid-operated injection valves
- 7 = Pressure regulator

- 8 = Temperature sensor (engine)
- 9 = Thermo-time switch
- 10 = Air-flow sensor
- 11 = Air filter

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Layout of components on the engine



280 / 1439

- 1 = Control unit
- 2 = 35-pin control-unit plug

INSTALLATION POSITION OF COMPONENTS

The indications "right" and "left" always refer to the forward direction of travel.

* L-Jetronic control unit

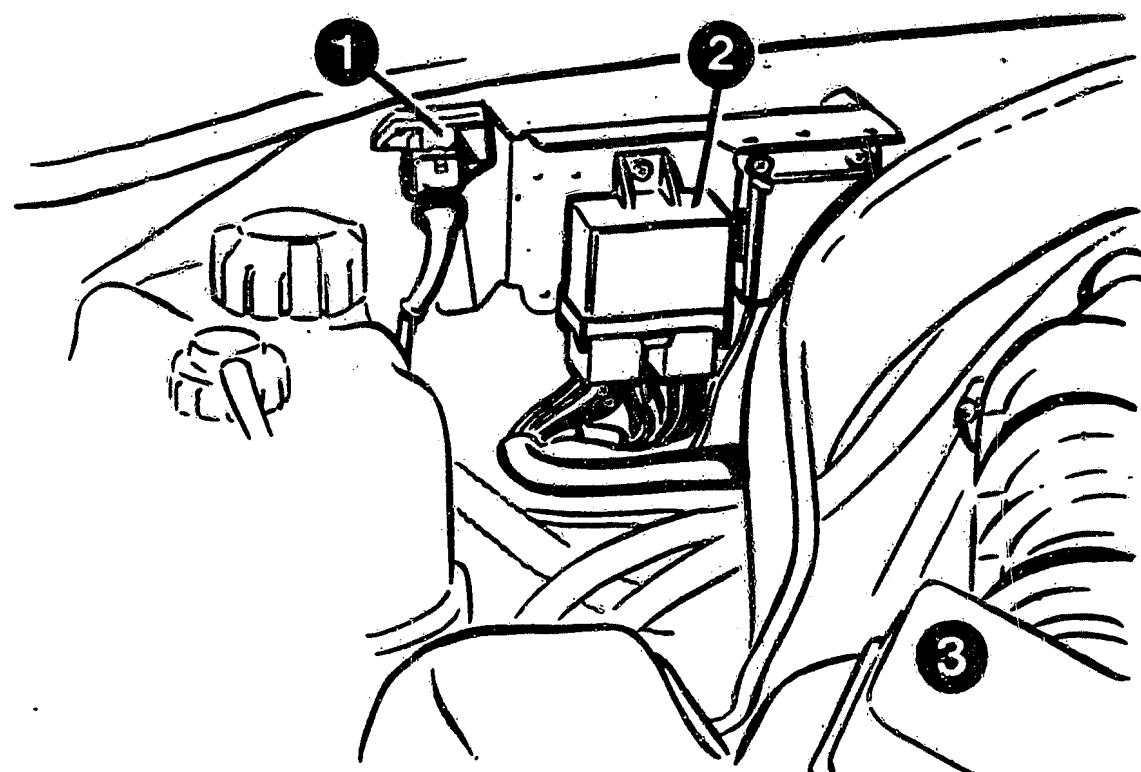
The control unit is located in the passenger compartment beneath the glove compartment.

To remove, remove panelling and loosen fastening screws on the control unit.

For testing electrically using universal test adapter, press open latch (locking tong) and disconnect control-unit plug. Connect 35-pin adapter lead to periphery.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

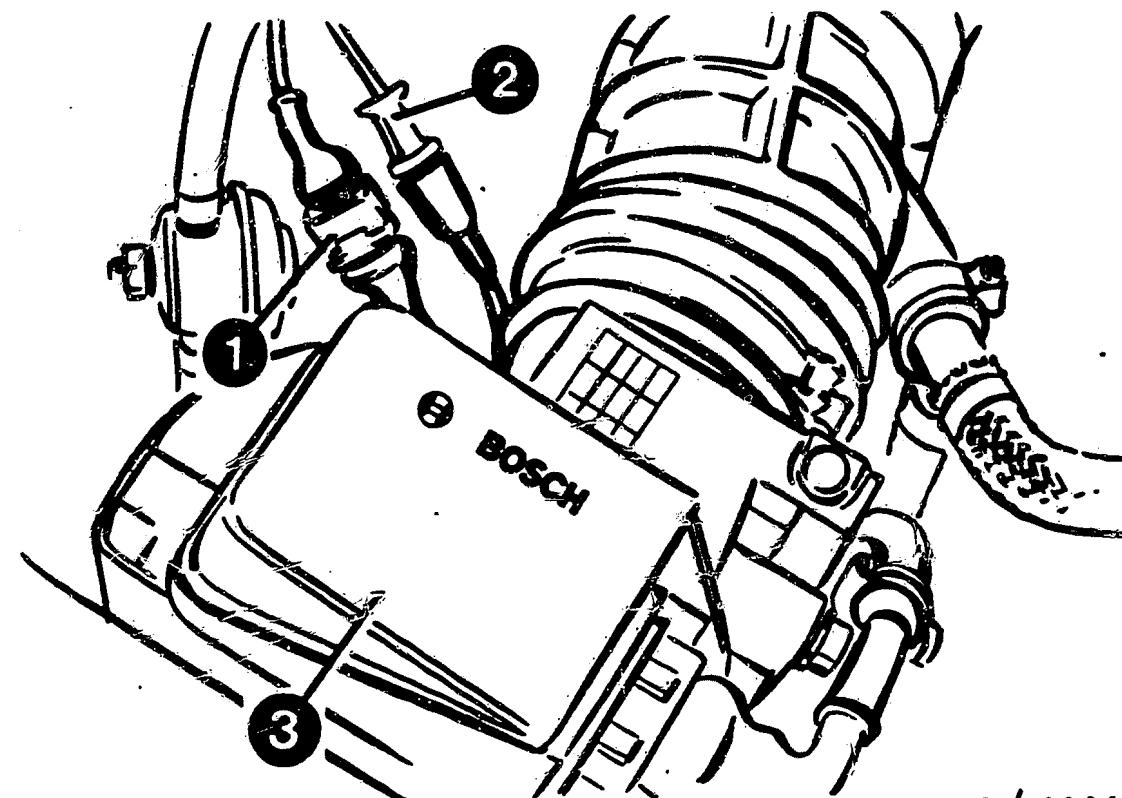
- * Electric fuel pump on vehicle floor panel in front of the rear axle.
- * In-tank pre-supply pump is accessible via a locking ring on the fuel tank.
- * Fuel filter on vehicle floor panel in front of the rear axle.
- * Heated lambda sensor in exhaust pipe upstream of the catalytic converter.
- * CO sampling pickup in screw plug upstream of the catalytic converter.



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- 1 = Pressure sensor (altitude sensor)
- 2 = Relay set
- 3 = Air-flow sensor

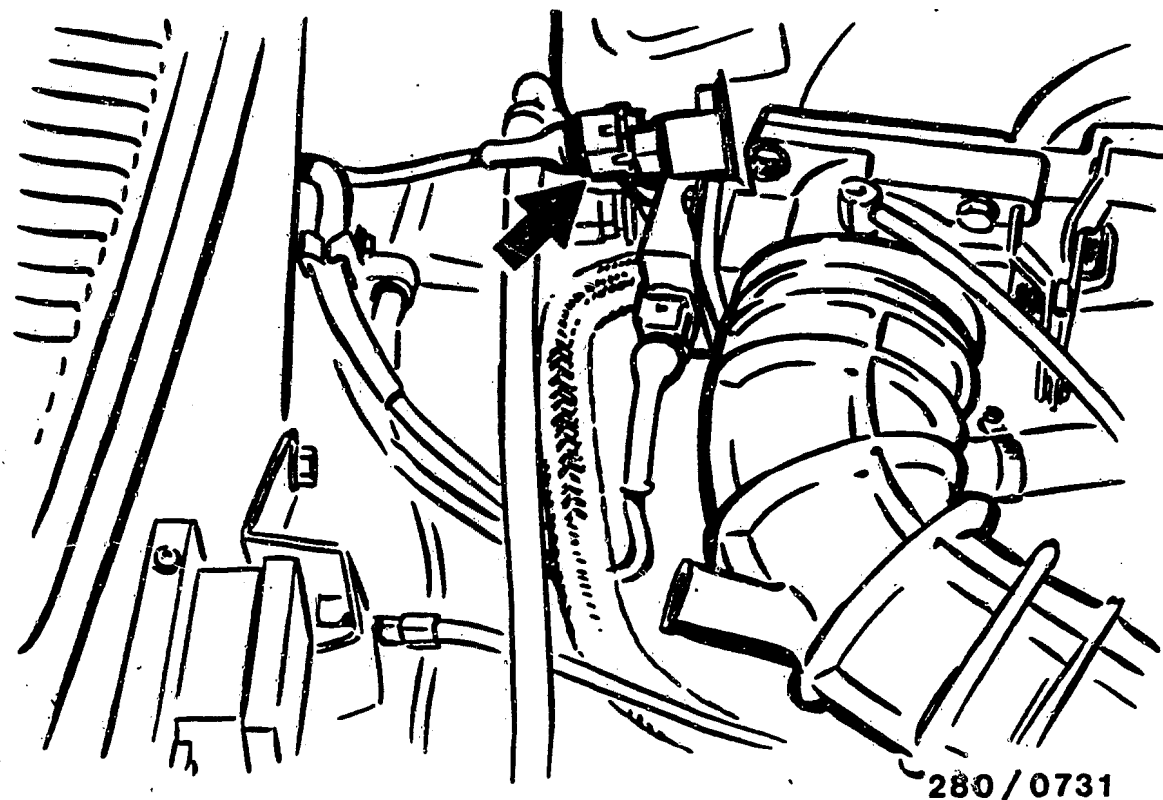
INSTALLATION POSITION OF COMPONENTS (CONTINUED)



280/1441

- 1 = Plug-in connection - sensor heater
- 2 = Plug-in connection - sensor signal
- 3 = Air-flow sensor

INSTALLATION POSITION OF COMPONENTS (CONTINUED)



Arrow = Cold-start valve

TESTING THE FUEL PRESSURE

Disconnect hose from the cold-start valve (arrow).

Connect pressure gauge.
Do not damage the cold-start valve when disconnecting and connecting the fuel pressure hose.

Make sure all connections are tight.

For production reasons:
continued on the following
coordinate.

Trouble-shooting instructions : BMW-5028

BOSCH system : Motronic M 1.3

Make of vehicle : BMW

Basic microcard : PKW-052

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SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models:
*BMW 730i with/without cat. converter as of 6.88
Engine: 3.0 l / 6 cyl.
*BMW 735i, 635CSi with/without cat. converter as of 6.88
Engine: 3.5 l / 6 cyl.

* Motronic system M 1.3 with self-diagnosis.

* The fault memory can be read out using the Pocket System Tester KTS 300 (0 684 400 300) with the program module PPG 204 as of status 09.01.89.

Note:

Further diagnosis possibilities (actuator diagnosis etc), which would be feasible with newer program-module statuses, are not evaluated with these vehicles.

Pay attention to operating instructions for KTS 300. Connection of the KTS 300 to the diagnosis socket in the vehicle is via the adapter lead 1 684 463 196 (BMW).

* As an alternative to the KTS 300, the self-diagnosis can be read out by way of a flashing code (not possible with all control units).

Note: Flashing code output is not possible with all control units.

* The self-diagnosis test table is arranged according to fault code nos. indicated by the KTS 300. The "Fault indication" column sometimes contains two types of fault which are optionally indicated by the tester, e.g.:
open circuit/short to ground (= 1st type of fault)
short to positive (= 2nd type of fault)

* The fault memory is cleared when performing tester diagnosis by means of a special clearance command or - in the case of flashing-code diagnosis - by clearing the full-load switch for at least 10 seconds during output of the flashing code "End of output".

SPECIAL FEATURES (CONTINUED)

- * 55-pole control unit with variant encoding.
Important note:
Refer to basic instructions for information which must be given when ordering control unit.
- * Group injection: breakdown into 2 groups which inject at different times (except during warm-up phase and when accelerating).
Synchronization by means of sensor on ignition cable of cyl.6).
Group 1: cylinders 2,4,6
Group 2: cylinders 1,3,5
- * Adaptive lambda closed-loop control and tank ventilation with pulsed valve (in the case of cat.).

Information on trouble-shooting:

1. Adaptive lambda closed-loop control.

Note:

If the engine won't start following fault elimination (e.g. after replacement of lambda sensor, injection valves or elimination of leaks in intake system or exhaust system etc.), briefly (at least 10 seconds) detach Motronic control-unit plug with ignition switched off. The adaption values are thus cleared. Then attempt to start again.

2. If the code for depriving the burglar alarm has been incorrectly entered or if there is a defect in the vehicle computer/burglar alarm, positive is switched to term. 38 of the Motronic control unit. The engine can then not be started.
For rapid testing, disconnect vehicle computer and alarm system module and attempt to start again (no voltage at term. 38).

SPECIAL FEATURES (CONTINUED)

Information on self-diagnosis:

- * The following applies to models with built-in fault lamp (CARB lamp) in the instrument panel (currently only US version; "Check Engine"):
the CARB lamp must light up after switching on the ignition. It goes out again after starting the engine provided that there is no fault in the fault memory. If, on the other hand, a severe fault is present (a so-called exhaust gas-relevant fault; static or sporadic fault), the CARB lamp remains constantly on after starting the engine or lights up when the engine is running. The flashing-code fault output is effected via the "CARB lamp".
- * On models where there is no built-in fault lamp in the instrument panel and in cases where there is no KTS 300 available, a lamp must be connected to term. 15 of the control unit for reading out the fault memory. For this purpose, the evaluation unit for flashing-code diagnosis KDAW 9980 is to be connected to the control-unit plug. The plug should not be detached, so as to avoid clearing the stored faults. Only detach handle cover, do not lift off plug insert. Connect up KDAW 9980 as follows:
Socket 1 (red) to battery positive (term. 30).
Socket 2 (black) to Motronic control unit term. 15 (use suitable test prod).
Do not connect sockets 3 and 4.
- * Initiation (stimulation) and continuation of the flashing-code fault output is effected by actuating the full-load switch 5 times (accelerate to full throttle 5 times within 5 seconds with ignition switched on). Each flashing code is output repeatedly until further switching is effected.
The last step is the appearance of the flashing code 0 0 0 0 or 1 0 0 0 = End of output.
- * Switch off ignition to terminate self-diagnosis.

SELF-DIAGNOSIS TEST TABLE

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions / Test conditions	Termi- nals	Set values
Data exchange not possible	—	—	Prerequisite for fault output: leads between control unit and diagnosis unit/fault lamp (flashing code) and voltage supply for control unit O.K. Note: Fault lamp is currently only installed in instrument panel on US models (CARB lamp).	13 55 15	—
Control unit Digital sec.(comput) defective	01	1211	Control unit defective.	—	—
Relay Fuel pump Op.circ/sh. to grnd. Short to B+	03	1261	Fault 1: open circuit (Op.circ) or short circuit to ground (sh. to grnd.) Fault 1 is only detected if other output stages are defective. Fault 2: short to positive (B+). Detach pump relay and measure voltage (with respect to ground) in frame (term. 86) with ignition on: Resistance of relay coil (term. 85/86): Check lead to control unit (term. 3).	3	10...15 V approx. 50...150 Ω
Idle actuator ZWD Winding 1/EWD Op.circ/sh. to grnd. Short to B+	04	1262	Fault code 4 refers to current path from control unit term. 4 to idle actuator term. 3. Check leads and plug connection of actuator for open circuit (Op.circ), short circuit to ground (sh. to grnd.) and short to positive (B+). Winding resistance of winding 1 of actuator at + 15 ... + 30° C between connections 3 and 2: Note: idle actuator only on models with no EPC.	4	17... 23 Ω
Valve Tank ventilation Op.circ/sh. to grnd. Short to B+	05	1263	Only CAT models have a tank ventilation valve. Check lead for contact with ground or positive. Valve winding resistance at +15...+30°C: Control unit is defective if lead and valve are O.K.	5	35... 55 Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions / Test conditions	Termi- nals	Set values
Air-flow sensor/ Air-mass sensor Signal too low Signal too high	07	1215	Signal too low: check lead to air-flow sensor term. 2 (signal) and term. 3 (approx. +5V) for open circuit and short circuit to ground. Signal too high: check lead to air-flow sensor term. 2 for short to positive (+5V or +12V) and ground lead (term. 4) for open circuit. Check resistances at air-flow sensor: between term. 2 and term. 4 (deflect sensor flap): between term. 3 and term. 4: Measure wiper voltage at term. 2 with plug connected and ignition on (sensor flap in off position): Slowly deflect sensor flap as far as full load:	7(S)* 12(+) 26(-)	_____ 8...2500 Ω 500...1100 Ω 0,2... 0,3 V greater than 4,2 V
Lambda control outside min. range outside max. range	10	1222	Check CO content (ahead of catalytic converter). Check intake system and exhaust system for leaks. Incorrect fuel pressure. Sensor defective. Injection valve(s) clogged or not functioning. Note: applies only to CAT models.	_____	_____
Fault lamp Op.circ/sh. to grnd. Short to B+	15	_____	Check lead to fault lamp for short circuit to ground (sh. to grnd.) and short to positive (B+). Open circuit (Op.circ) is not detected! Note: fault lamp is currently only installed in instrument panel of US models (CARB lamp).	15	_____
Injectors (Group 2) Op.circ/sh. to grnd. Short to B+	16	1251	Fault: short circuit to ground (sh. to grnd.), to positive (B+) or open circuit (Op.circ) in joint positive/negative lead. Check injection valves of cyl. 1, 3, 5 for short circuits or open circuits. Control unit is defective if injection valves and leads are O.K. Note: open circuits in individual injection valves are not detected by the self-diagnosis.	16	4,8... 5,8 Ω (3 valves in parallel) 14,5...17,5 Ω (1 injection valve)

*) $S = \text{Signal}$

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions / Test conditions	Termi- nals	Set values
Injectors (Group 1) Op.circ/sh. to grnd. Short to B+	17	1252	Fault: short circuit to ground (sh. to grnd.), to positive (B+) or open circuit (Op.circ) in joint positive/negative lead. Check injection valves of cyl. 2, 4, 6 for short circuits or open circuits. Otherwise trouble-shooting as for fault code 16.	17	4,8... 5,8 Ω (3 valves in parallel) 14,5...17,5 Ω (1 injection valve)
Idle actuator ZWD Winding 2 Op.circ/sh. to grnd. Short to B+	22	1262	Fault code 22 refers to current path from control unit term. 22 to idle actuator term. 1. Check leads and plug connection of actuator for open circuit (Op.circ), short circuit to ground (sh. to grnd.) and short to positive (B+). Winding resistance of 2nd winding of actuator at +15...+30°C between connections 1 and 2: Note: idle actuator only on models with no EPC.	22	19...25 Ω
Lambda sensor Open circuit Short to ground Short to B+	28	1221	Check lead for open circuit (Op.circ), short circuit to ground and short to positive (B+). Pay attention to worn insulation! Sensor heater defective. Sensor clogged. Note: applies only to CAT models.	28	—
Speed signal Incorrect/no signal	29	—	Check lead from Motronic term. 29 to instrument cluster for open circuit, short circuit to ground and short to positive. Continue trouble-shooting in instrument cluster if leads and plug connections are O.K. Note: term. 29 is not used on models with EPC.	29	—
Battery voltage too low too high	37	1231	Supply voltage for control unit too low: Check voltage dips at positive and ground terminal. Charge battery. Supply voltage for control unit too high: Check alternator regulator.	18 19 (+) (-)	greater than 9 V (with engine running) less than 16 V (with engine running)

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions / Test conditions	Termi- nals	Set values
ASR/MSR interface Short to B+	38	—	Check lead between Motronic and ABS/ETC (ASR/MSR) control unit (if provided) or burglar alarm for short to positive (B+). Continue trouble-shooting with ETC or burglar alarm if leads and plug connections are O.K.	38	—
Air-temp. sensor Op. circ./sh. to B+ Short to ground	44	1224	Check temperature sensor and lead for open circuit, (Op. circ), short to ground and short to positive (B+). Temperature-sensor resistance at +15...+30°C:	44	1450...3300 Ω
Engine temp. sensor Op. circ./sh. to B+ Short to ground	45	1223	Check temperature sensor and lead for open circuit, (Op. circ), short circuit to ground and short to positive (B+). Temperature-sensor resistance at +15...+30°C: at approx. +80°C:	45	1450...3300 Ω 280... 360 Ω
Transmission identification Short to ground	51	1278	Check lead for short circuit to ground or corresponding output in transmission control unit (term. 24) defective. Note: fault 51 applies to models with electronic transmission control (GS); term. 51 must be open on models with no transmission control.	51	—
Idle switch Short to ground	52	1232	Models with EPC: Fault 1: short circuit to ground in lead to EPC control unit term. 4 or lead between EPC control unit term. 4 and pedal position sensor. Fault 2: EPC control unit defective (defective output stage). Models with no EPC: Fault: idle contact (in throttle-valve switch) permanently closed or short circuit to ground in lead. Idle contact closed in off position: Actuate throttle valve somewhat:	52	— approx. 0 Ω infinity Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions / Test conditions	Termi- nals	Set values
Full-load switch Short to ground	53	1233	Models with EPC: Fault 1: short circuit to ground in lead to EPC control unit term. 28. Fault 2: EPC control unit defective (defective output stage). Models with no EPC: Fault: full-load contact (in throttle-valve switch) permanently closed or short circuit to ground in lead. Full-load contact closed in full-throttle position: Release accelerator pedal somewhat:	53	_____ approx. 0 Ω infinity Ω
Converter clutch/ Driving pos. switch Comparison not O.K.	54 (24)	_____	Note: fault code 24 corresponds to fault code 54 Check lead between Motronic term. 54 and transmission control term. 25 for short circuit to ground. Continue trouble-shooting with transmission control if lead is O.K.	54	_____
CU output stages with fin.cntling el. defective	100	_____	CU = control unit. Check following components and leads for open circuit, short circuit to ground and short to positive: Injection valves, fuel-pump and sensor-heater relay, tank ventilation valve, fault lamp (US only).	16 17 3 23 5 15	_____
No fault stored	_____	1444	Continue trouble-shooting with trouble-shooting chart.	_____	_____
_____	_____	1000	End of output (flashing code only)	_____	_____

TEST SPECIFICATIONS

Pressure regulator

Fuel pressure 3,0 l: 2,8...3,2 bar
3,5 l: 2,8...3,2 bar

Electric fuel pump

Delivery (measured in return): min. 950 cm³ /30s

Supply voltage

(under load): min. 12 V

Temperature sensor (air)

Internal resistance
measured at air-flow sensor
between term. 1 and term. 4

at ambient temperature
(+15°C...+30°C): 1450...3300 Ω

Temperature sensor (engine)

(plug color blue)

Internal resistance

at + 15° C...+ 30° C : 1450...3300 Ω
with engine at operating temp.
(approx. + 80° C): 280... 360 Ω

Solenoid-operated injection valve

Internal resistance

at ambient temperature
(+ 15° C...+ 30° C): 14,5...17,5 Ω

Air-flow sensor

Internal resistance between

term. 2 and term. 4 : 8...2500 Ω (*)
term. 3 and term. 4 : 500...1100 Ω

(*) Slowly deflect sensor flap as far as it will go.
Fluctuating increase in resistance with slight
decrease towards end.

TEST SPECIFICATIONS (CONTINUED)

Engine-speed/reference-mark sensor

Internal resistance

between term. 1 and term. 2 at
ambient temperature (+15°C...+30°C): 400...800 Ω
Air gap: 0,8 ± 0,5 mm

Throttle-valve switch

Resistance value of idle contact

term. 1 (6)* and term. 2 (4)* : Approx. 0 Ω

Resistance value of full-load contact

term. 3 (5)* and term. 2 (4)* : Approx. 0 Ω

Idle actuator

Internal resistance

at +15°...+30°C between
term. 1 and term. 2 : 19...25 Ω
term. 3 and term. 2 : 17...23 Ω

Lambda sensor

Resistance value of heater winding

(sockets 3 and 4 in 4-pole pin
terminal for lambda sensor) : 1...15 Ω

Ignition coil

Primary resistance:

Approx. 0,4 Ω

Secondary resistance:

Rod-type coil 4300... 7700 Ω

Plastic coil (new) 6500...11500 Ω

Interference-suppression resistors

High-voltage distributor rotor: 1 k Ω

High-voltage distributor domes: Each 1 k Ω

Spark-plug connectors: Each 5 k Ω

Spark plugs: 5 k Ω

Ignition coil: 1 k Ω

*) Value in brackets applies to version with
electronic transmission control

TEST SPECIFICATIONS (CONTINUED)

High-voltage sensor:

Internal resistance

between term. 1 and term. 2: Approx. 0,2...1 Ω

Tank ventilation valve:

(only in vehicles with catalytic converter)

Internal resistance at

ambient temperature (+15°C...+30°C): 35...55 Ω

Idle test:

Engine at operating temperature,
switch off loads.

Idle speed 3,0 l: 800 \pm 50 min⁻¹
 3,5 l: 800 \pm 50 min⁻¹

Ignition angle 3,0 l: 10 \pm 5° CS
 3,5 l: 10 \pm 5° CS

(Automatic transmission on N or P)

CO content:

without catalytic converter: 1,0 \pm 0,5 vol.% CO

Adjust mixture at bypass screw in

air-flow sensor:

Turning in an anti-clockwise direction

produces leaner mixture,

turning in a clockwise direction

produces richer mixture.

Vehicles with catalytic

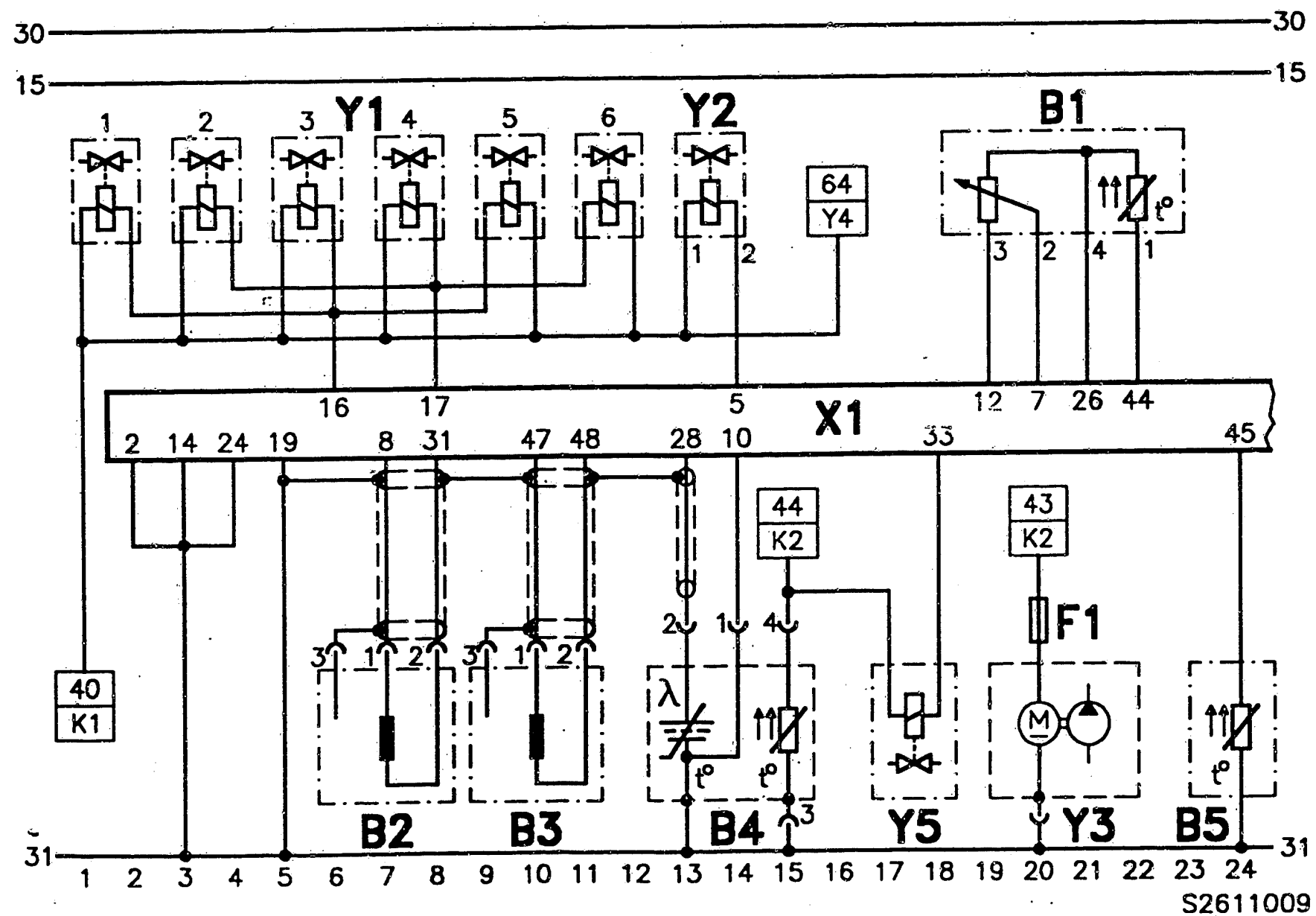
converter:

0,7 \pm 0,5 vol.% CO

(Measure CO ahead of catalytic converter)

Please refer to equipment and Autodata microcard for
settings as regards valve clearance and other engine-
related data.

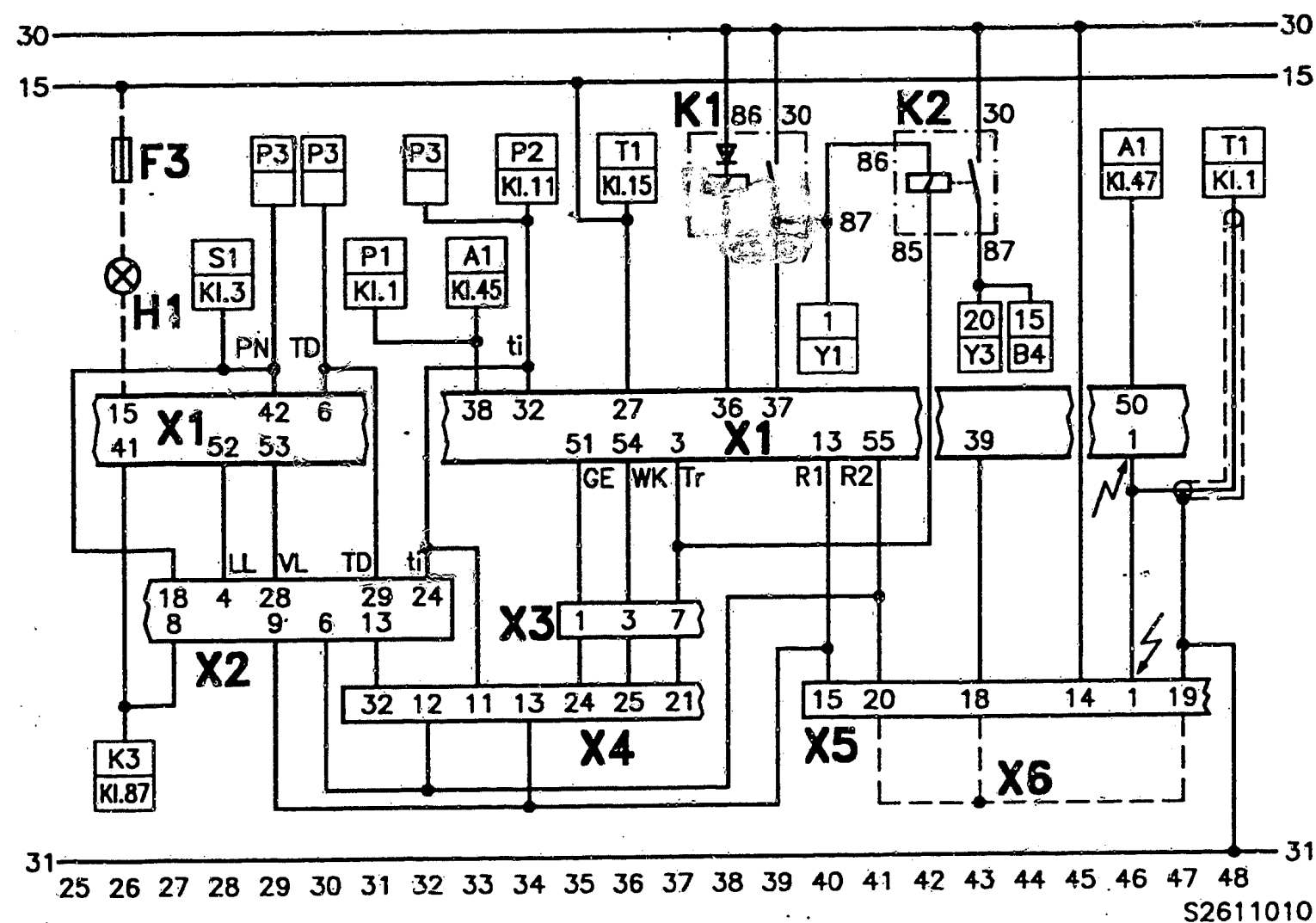
For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

- | | | |
|---|---------------------------------|---|
| B1 = Air-flow sensor | K1 = Main relay | Y2 = Tank ventilation valve (cat only) |
| B2 = H.T. sensor | K2 = Pump relay | Y3 = Electric fuel pump |
| B3 = Engine-speed/reference-mark sensor | K3 = Sensor heater relay | Y4 = Idle actuator (on models with no EPC) |
| B4 = Heated lambda sensor (cat) | X1 = Motronic control unit plug | Y5 = Solenoid valve for downshift block in transmission trigger box * |
| B5 = Temperature sensor (engine) | | |
| F1 = Pump fuse | | |

*) Only on automatic transmission with hydraulic control



ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

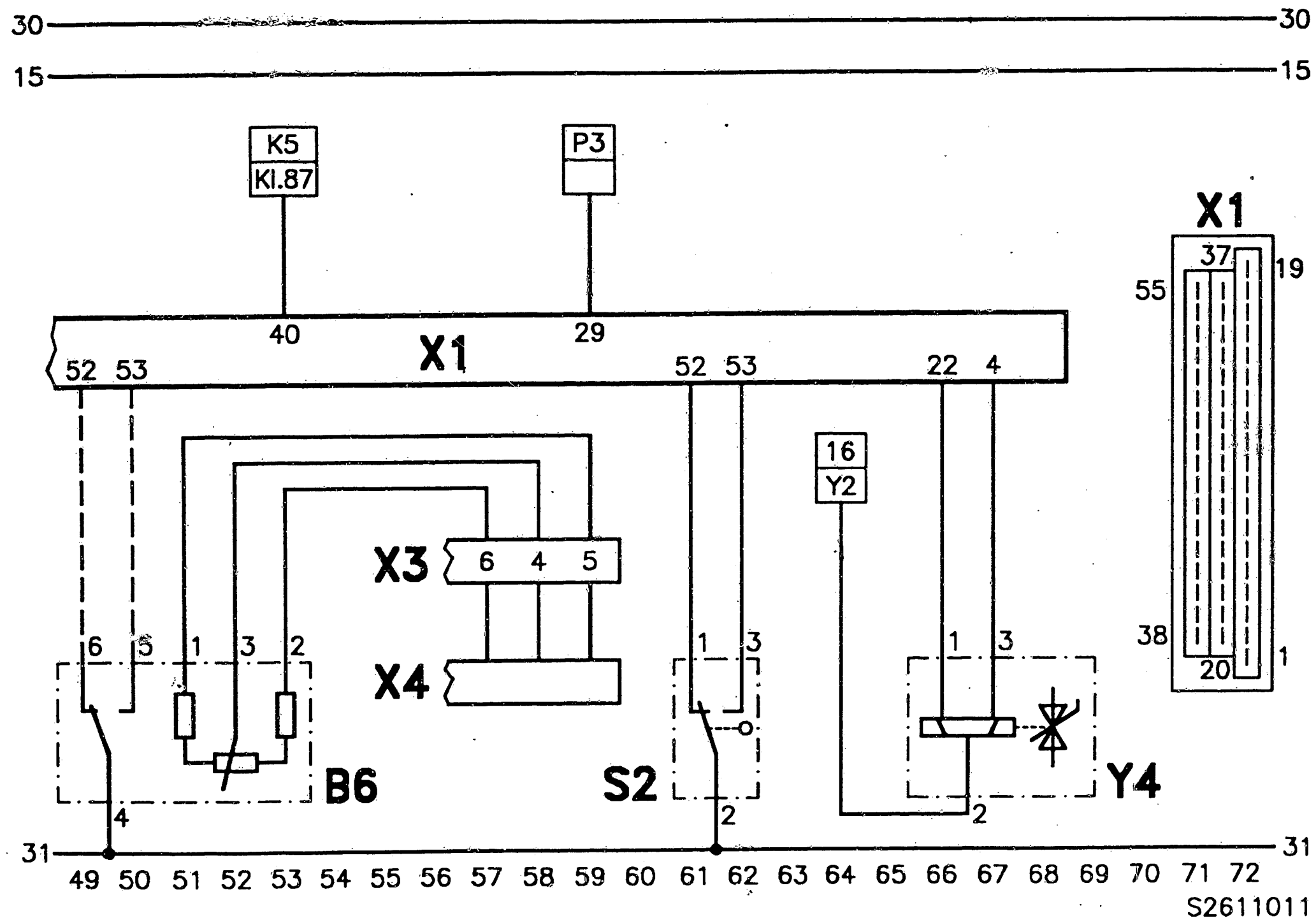
A1 = ABS/ETC control unit
(if ETC* provided)
B1 = Air-flow sensor
B4 = Heated lambda sensor (cat)
F3 = Fuse
H1 = "CARB" lamp (fault lamp;
US version only)
K1 = Main relay
K2 = Pump relay
K3 = A/C relay (if A/C
provided)
P1 = Burglar alarm

P2 = Vehicle computer
P3 = Instrument cluster
R1 = Stimulation lead
R2 = Serial interface
S1 = Driving position switch
(automatic)
T1 = Ignition coil
X1 = Motronic control-unit
plug
X2 = EPC control-unit plug
(model with EPC)
X3 = Plug connection to
GS control unit**

X4 = GS control-unit plug
(model with GS **)
X5 = Diagnosis unit
X6 = Jumper in diagnosis-unit
cover
LL = Idle signal
VL = Full-load signal
TD = Engine speed
ti = Injection time
GE = Gear mesh
WK = Converter clutch
Tr = Engine speed signal for GS
PN = Park / Neutral

*) ETC = Electronic Traction Control (BMW designation: ASC = Automatic Stability Control)

***) GS = Transmission Control



ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

B6 = Throttle-valve switch with potentiometer
on models with no EPC
(for item S2 on models with transmission control)

K5 = A/C compressor relay (if A/C provided)

P3 = Instrument cluster

S2 = Throttle-valve switch for models with no EPC
(for item B6 on models with manual transmission)

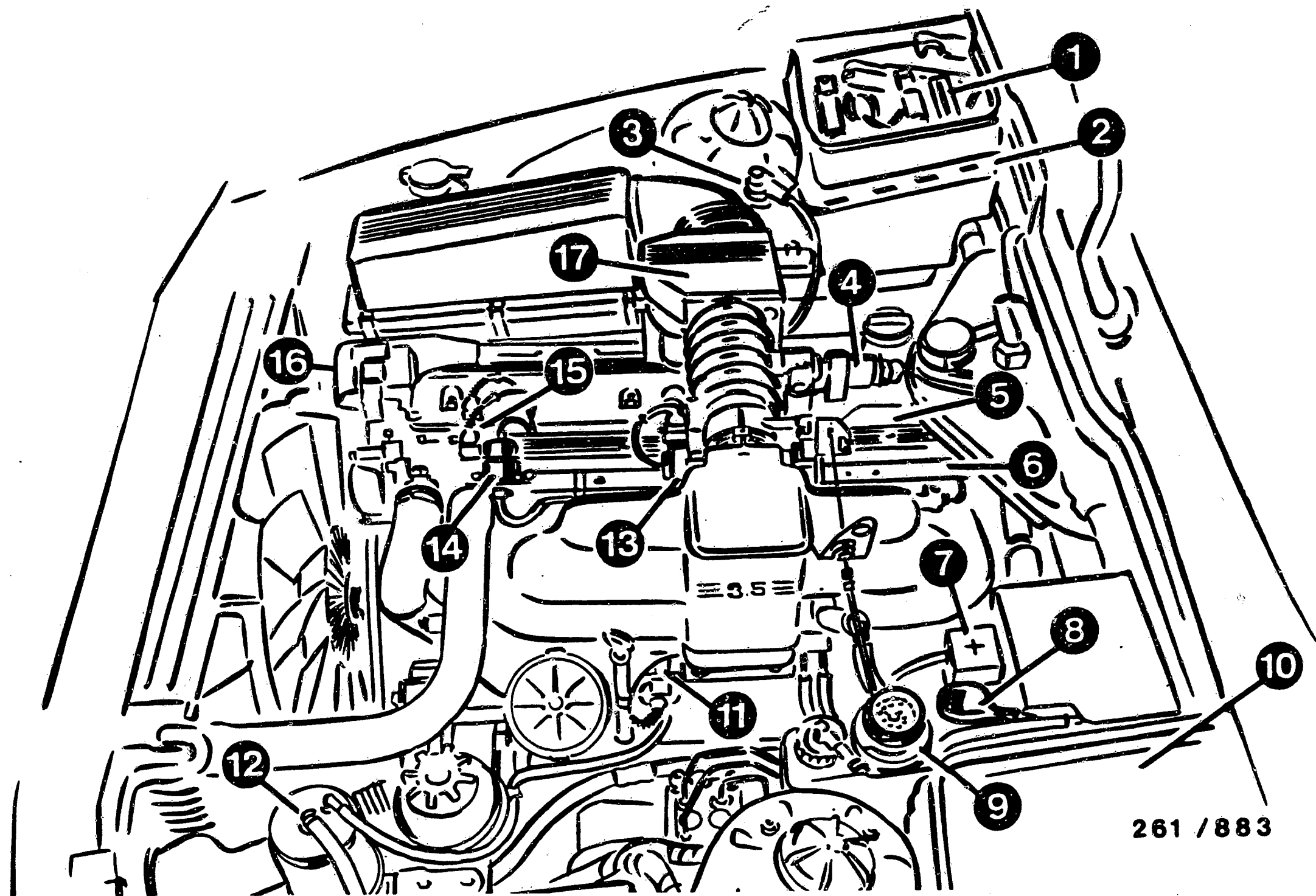
X1 = Motronic control-unit plug

X3 = Plug connection to GS control unit

X4 = GS control-unit plug
(with transmission control)

Y2 = Tank ventilation valve (cat only)

Y4 = Idle actuator
(on models with no EPC)



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INSTALLATION POSITION OF COMPONENTS

1= Motronic control unit
 2= Motronic ground terminal
 (beneath cover)
 3= Ignition coil
 4= Idle actuator
 5= Cover over solenoid-operated
 injection valves

6= Fuel distributor
 7= Battery positive terminal
 8= Engine plug
 9= Diagnosis unit
 10= Fuse box
 11= Tank ventilation valve

12= Active-carbon container
 13= Throttle-valve switch
 14= Fuel pressure regulator
 15= Temperature sensor (engine)
 16= H.T. distributor
 17= Air-flow sensor

BOSCH system	: Mono-Jetronic
Make of vehicle	: FIAT / LANCIA
Basic microcard	: KFZ-00..

Section	Coordinates
Special features, usage, safety	02
Trouble-shooting chart	05
Rapid diagnosis chart	07
Test specifications	11
Electrical terminal diagram	15
Plug assignment of fuel-injection unit	
Installation position of components, removal and installation instructions	19

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models:

Fiat with 0.999 l/ 4-cyl. engine:			
Panda 1000	1.e.	A,CH,D,S	10.87->
Panda 4x4	1.e.	A,CH	10.87->
Uno 45	1.e.	A,CH,D,S	10.87->
Lancia Y10	1.e. 4WD	A,CH	10.87->
Lancia Y10	1.e.	A,CH,D,S	10.87->

Fiat with 1.108 l/ 4-cyl. engine:		
Panda 1100 i.e.	EU	1.90-->
Uno 45 i.e.	EU	1.90-->
Lancia Y10 i.e.	EU	3.89-->

- * Mono-Jetronic with 25-pole control unit:
0 280 000 710, 0 280 000 715, 0 280 000 732
Engine-speed triggering by means of term. 1
signal from ignition coil.
- * Adaptive lambda closed-loop control with lambda sensor.
- * Throttle-valve positioner with idle contact for idle-speed regulation.
Adjustment of assignment screw at throttle-plate lever, see PKW-135.
- * Pump relay for in-tank fuel pump.
- * For testing fuel pressure, make use of pressure gauge KDJE-P100/17 and hoses of pressure measuring device.
Connect up 3-way line KDJE-P 100/13 between fuel inlet line and throttle-body injection unit.
- * Load-dependent flushing of active-carbon container by way of pulsed tank-ventilation timing valve and switching valve.
- * 2-pole plug on control unit for Fiat diagnosis tester.
No flashing code.
- * Vehicles with no catalytic converter are equipped with a lead-tolerant lean sensor (4-pole).
This sensor supplies a voltage of approx. 20...40 mV in the lean range (lambda 1.2) in addition to the voltage step change (approx. 0.1/0.8 V) with lambda 1.0.
The engine is thus regulated at part load.

SPECIAL FEATURES (CONTINUED)

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

- * The assignment screw (at the bottom of the throttle-plate lever) is not to be used for adjusting the idle speed. It serves to set the position of the throttle valve with respect to the throttle-valve positioner. This is only necessary when renewing the throttle-valve section or the throttle-valve positioner.
- * Do not turn stop screw (minimum stop) of throttle valve as otherwise the control unit detects a fault. Screw is permanently set and secured against being turned.
- * Do not actuate idle contact with throttle valve deflector (part and full-load range). This could cause the throttle-valve positioner to block.
- * Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as this may alter the fuel pressure.
- * Do not adjust throttle-valve potentiometer. There is no service potential for checking assignment of throttle-valve position (angle) with respect to potentiometer.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults. For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

- * Avoid injection of fuel when testing the compression.
To ensure this, disconnect pump relay.

For further precautionary measures, see brief instructions.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*			*	Universal test adapter
*	*	*	*		*					Air intake system
				*	*					Fuel delivery
*	*	*	*		*	*	*			Fuel pressure, leakage
		*		*	*	*	*			Solenoid-operated injection valve
				*						Alternator, interference suppression
*	*	*				*				Start control
				*		*				Overrun cutoff
		*	*	*		*				Engine-speed, CO-adjustment
		*	*	*		*				Lambda closed-loop control
					*					Exhaust-gas catalytic converter
		*	*				*			Tank ventilation

For production reasons:
continued on the following
coordinate.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

Adapter lead: 1 684 463 170

Test step	Switch V	Ω	Terminals	Testing of component/function	Test instructions/ Test conditions	Set values
1	5	—	1 — 5 (+) (—)	Term. 1 signal from ignition coil term. 1	Transmission in neutral, start	Ignition pulses on oscilloscope
2	6	—	4 — 5 (+) (—)	Voltage supply of control unit		8...15 V
3	7	—	9 — 5 (+) (—)	Voltage supply via main relay	Switch on ignition	8...15 V
4	8	—	17 — 5 (+) (—)	Simulated actuation Electric fuel pump	Switch on ignition Press button 3	Electric fuel pump runs, check by listening
5	8	—	17 — 5 (+) (—)	Pump relay	Switch on ignition	8...15 V
6	9	—	15 — 5 (+) (—)	A/C readiness (if provided)	Switch on ignition, switch on A/C	8...15 V
7	10	—	16 — 5 (+) (—)	A/C compressor (if provided)	Switch on ignition, switch on A/C	8...15 V
8	12	—	12 — 5 (+) (—)	Tank-ventilation timing valve	Switch on ignition Press button 4	Timing valve must be energized, check by listening
9	—	—	—	Not applicable		
10	—	—	—	Not applicable		
11	1 V	7	3 — 5	Thr.-valve positioner Idle contact	Ignition "OFF" Accelerator pedal in off-position : Depress accelerator pedal somewhat:	0...10 Ω infinity Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)

Adapter lead: 1 684 463 170

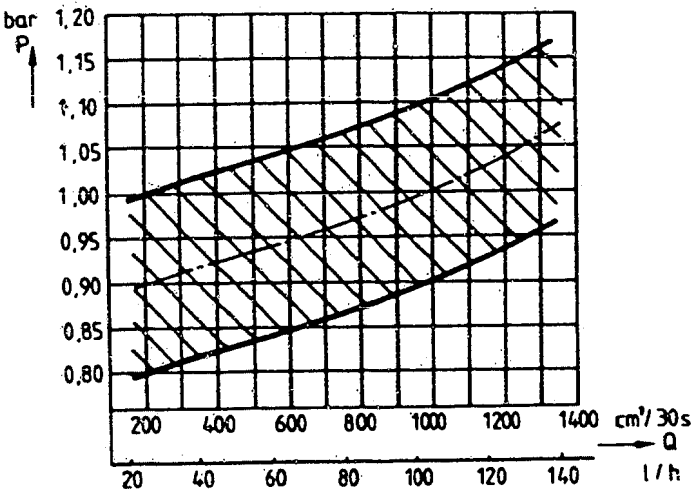
Test step	Switch	Termi- nals	Testing of component/function	Test instructions/ Test conditions	Set values	
V	Ω					
12	 V	8	6 - 5	Ground connection (transmission switch)	Ign. "OFF", manual shift lever arbitrary, automatic P/N: Automatic Drive:	0...10 Ω infinity Ω
13	-	-	-	Not applicable		
14	-	-	-	Not applicable		
15	 V	11	14 - 5	Temperature sensor (intake air)	Ambient temperature +15...30 °C ; at approx.+50°C:	1.45...3.3 k Ω 700 ...950 Ω
16	 V	12	2 - 5	Temperature sensor (engine)	Ambient temperature +15...30 °C ; Engine at operating temperature approx. +80 °C :	1.45...3.3 k Ω 280...360 Ω
17	 V	13	25 - 5	Ground connection Output stage		0...10 Ω
18	 V	14	13 - 5	Solenoid-operated inj. valve and series resis.		6...12 Ω
19	 V	15	8 - 5	Throttle-valve potentiometer		600...1400 Ω
20	 V	16	7 - 18	Throttle-valve potentiometer	Deflect throttle valve (maximum value at part load)	400...4000 Ω
21	 V	20	23 - 24	Throttle-valve positioner		4...250 Ω

NOTE: The following components with the corresponding connecting leads are not covered by the universal test adapter in the course of testing:

1. Lambda sensor with heater
2. Tank-ventilation switching valve.

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Delivery at return:	min. 550 cm ³ /30s
* Supply voltage under load:	min. 12 V
Pressure regulator	
* Fuel pressure with engine stopped:	see diagram
Solenoid-operated injection valve	
* Internal resistance between t. 2 and t. 3 at ambient temperature +15...+30 °C :	1,0...1,6 Ω
* Leakage after 60 s:	a max. of one droplet may drip off
Series resistor	
* Internal resistance:	2,5...4,0 Ω
Throttle-valve potentiometer	
* Internal resistance between t. 5 and t. 1 :	600...1400 Ω
t. 4 and t. 2:	400...4000 Ω
Deflect throttle valve (maximum value at part load)	
Throttle-valve positioner	
* Internal resistance between t. 1 and t. 2 :	4...250 Ω
* Idle contact t. 3 and t. 4:	0...0,5 Ω
Lambda sensor heater	
* Internal resistance (PTC) with engine stopped:	1...15 Ω



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Q = Fuel delivery of electric fuel pump
 p = Primary pressure

TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Temperature sensor (engine)

- | | |
|---|-----------------------|
| * Internal resistance at ambient temperature +15...+30 °C : | 1,45...3,3 k Ω |
| with engine at operating temperature approx. +80 °C : | 280...360 Ω |

Temperature sensor (intake air)

- | | |
|---|-----------------------|
| * Internal resistance between t. 1 and t. 4 at ambient temperature +15...+30 °C : | 1,45...3,3 k Ω |
| at approx. +50°C : | 700...950 Ω |

Start control

- | | |
|--|-------------------------------------|
| * Voltage at injection valve Start initiation after approx. 15s: | greater than 1,0 V
approx. 0,3 V |
|--|-------------------------------------|

Tank-vent. timing valve and tank-vent. switching valve

- | | |
|---|------------------|
| * Internal resistance at ambient temperature +15...+30 °C, timing valve : | 35...55 Ω |
| Switching valve, non-Bosch : | 15...35 Ω |

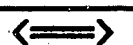
Idle

Engine at operating temperature approx. +80°C

- | | |
|---|-----------------------------|
| * Idle speed: | 800...900 min ⁻¹ |
| * Lambda sensor voltage Exhaust gas "lean": | 0,05...0,3 V |
| Exhaust gas "rich": | 0,60...1,0 V |

Idle speed and lambda closed-loop control cannot be adjusted (adaptive regulation)

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TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Lean sensor

(only for vehicles with no catalytic converter)

- | | |
|---|--------------|
| * Lambda sensor voltage Voltage step change, lambda 1.0 Exhaust gas "lean": | 0,02...0,3 V |
| Exhaust gas "rich": | 0,60...1,0 V |

Lean range, lambda approx. 1.2

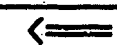
Disconnect sensor plug and connect digital multimeter to grey and black lead. Heating remains connected.

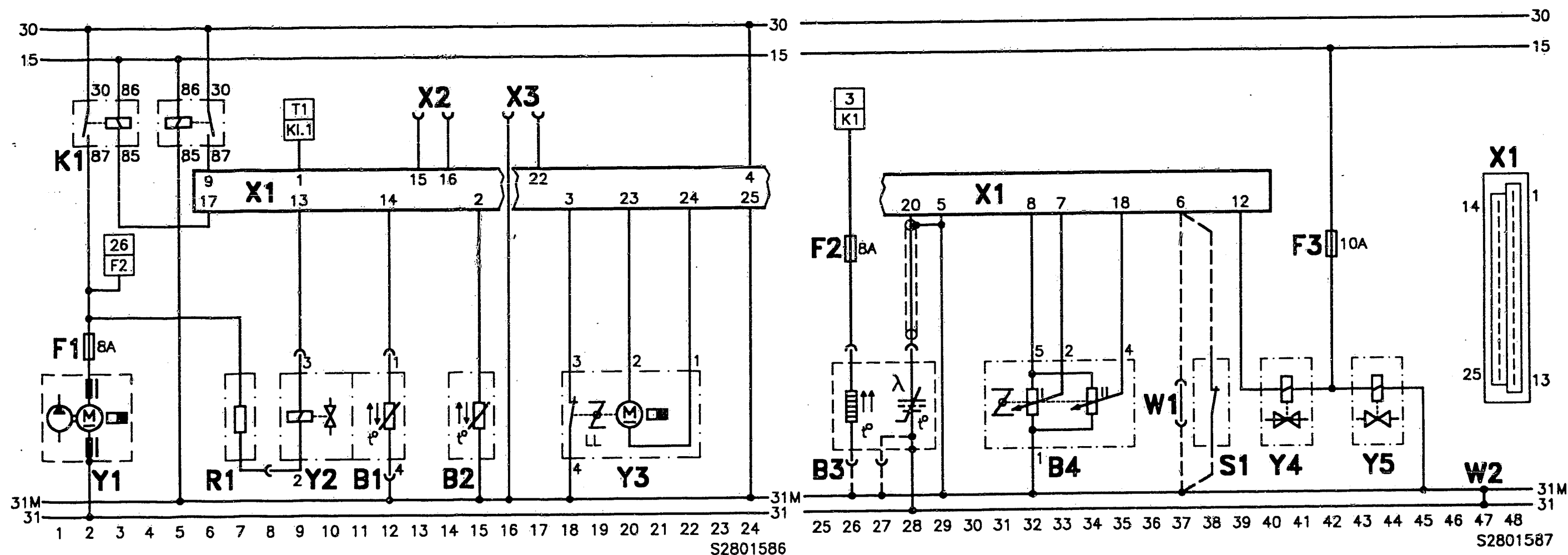
Effect leaning of exhaust gas, e.g. by detaching a vacuum hose at injection unit.

- | | |
|------------------------------|------------|
| * Sensor voltage Lean value: | 20...40 mV |
|------------------------------|------------|

See equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data.

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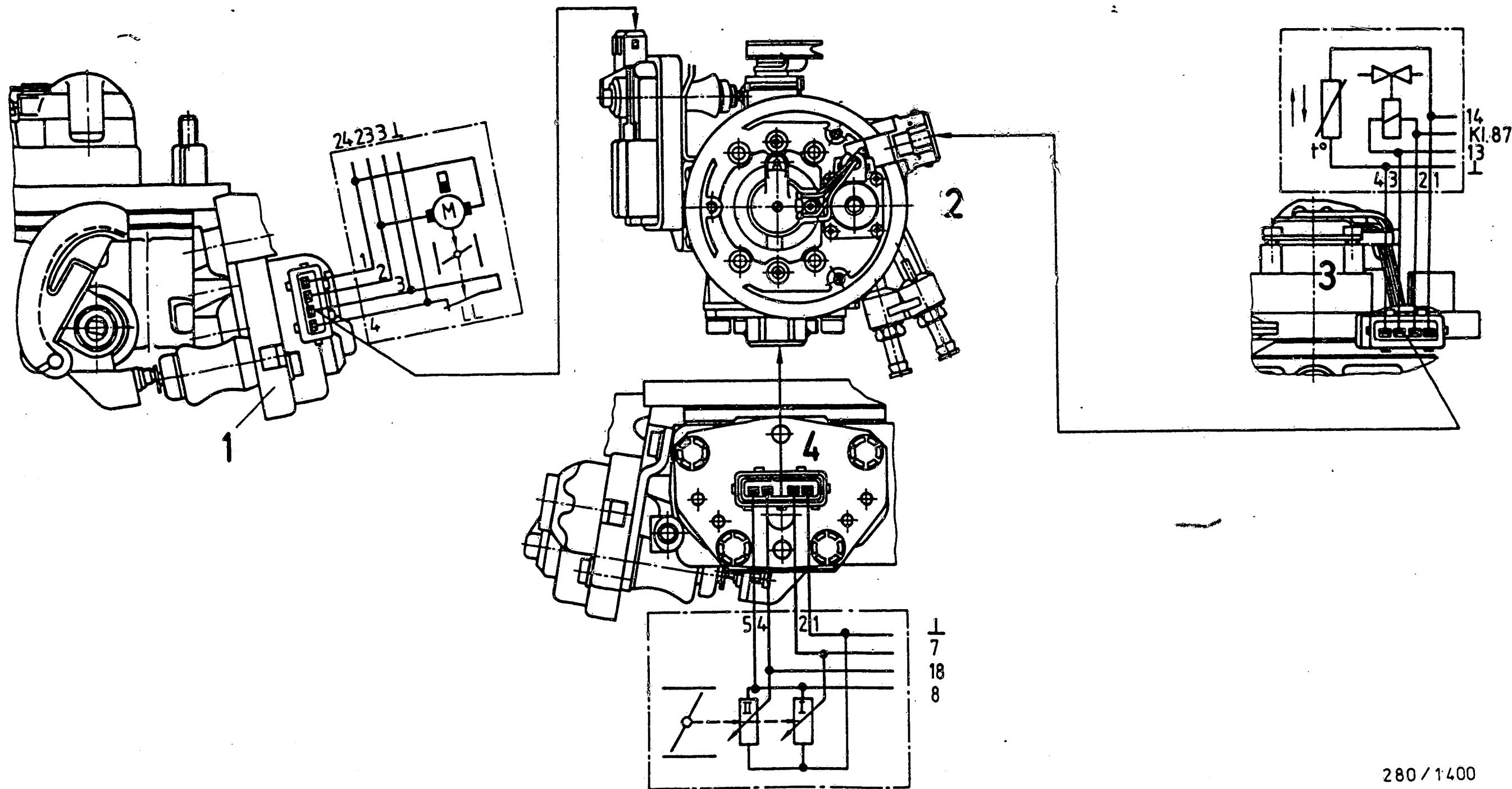


ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (intake air)
 B2 = Temperature sensor (engine)
 B3 = Lambda sensor, heated
 (in some cases lean sensor, 4-pole)
 B4 = Throttle-valve potentiometer
 F1 = Fuse (fuel pump)
 F2 = Fuse (sensor heater)
 F3 = Fuse
 K1 = Pump relay
 K2 = Main relay

R1 = Series resistor
 S1 = Drive switch (automatic
 transmission only)
 T1 = Ignition coil
 W1 = Jumper (manual
 transmission only)
 W2 = Ground strap, engine
 X1 = Control-unit plug
 X2 = Plug for A/C
 X3 = Diagnosis plug for

Fiat diagnosis tester
 Y1 = Electric fuel pump
 Y2 = Solenoid-operated injection valve
 Y3 = Throttle-valve
 positioner
 Y4 = Tank-ventilation timing
 valve
 Y5 = Tank-ventilation
 switching valve

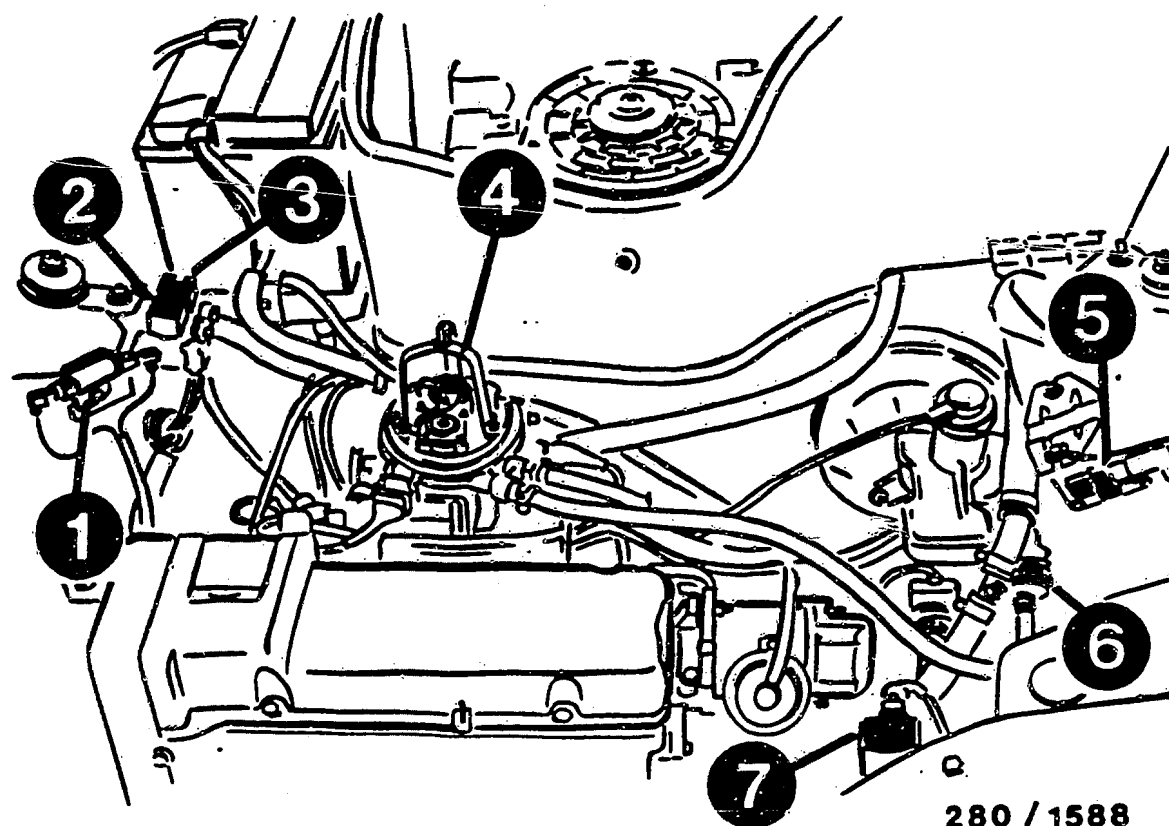


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PLUG ASSIGNMENT OF THROTTLE-BODY INJECTION UNIT

- 1 = Throttle-valve positioner
with idle contact
- 2 = Throttle-body injection unit

- 3 = Solenoid-operated injection valve
and temperature sensor (intake air)
- 4 = Throttle-valve potentiometer

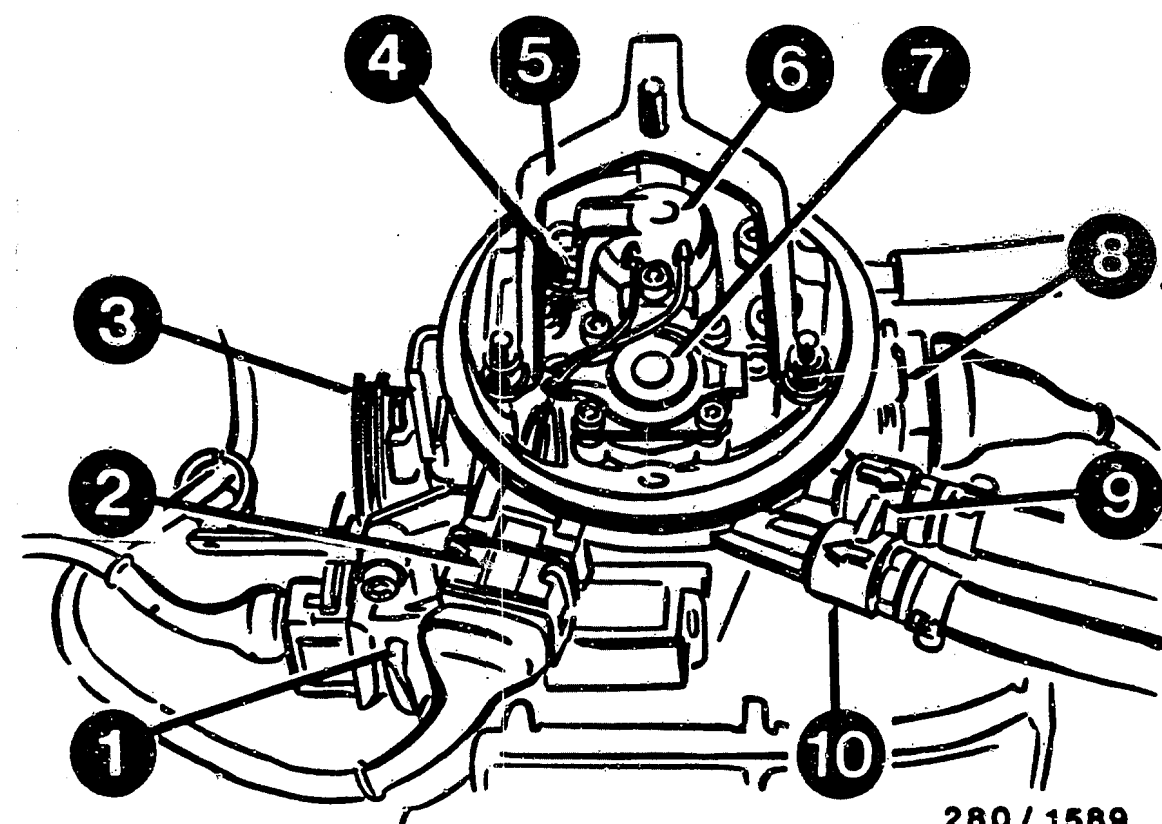


- 1 = Series resistor
- 2 = Main relay
- 3 = Pump relay
- 4 = Throttle-body injection unit
- 5 = Ignition coil
- 6 = Fuel filter
- 7 = Tank-ventilation switching valve (non-Bosch)

INSTALLATION POSITION OF COMPONENTS

All installation locations refer to the direction of travel.

Arrangement of components in engine compartment.
Air filter and spare wheel have been removed in the picture.



- 1 = Throttle-valve positioner
- 2 = Quadruple plug for injection valve and temperature sensor (intake air)
- 3 = Pulley wheel
- 4 = Temperature sensor (intake air)
- 5 = Bracket for air-filter attachment
- 6 = Solenoid-operated injection valve
- 7 = Pressure regulator
- 8 = Throttle-valve potentiometer
- 9 = Fuel return line
- 10 = Fuel inlet line

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

- * The control unit is mounted on the passenger's side behind the glove compartment.
- * The in-tank electric fuel pump is installed in the fuel tank. It is accessible under the seat bench after lifting the bench.
- * The lambda sensor is screwed into the twin exhaust pipe at the front of the engine.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Top picture

- 1 = Ignition coil
- 2 = Fuel filter

* Center picture

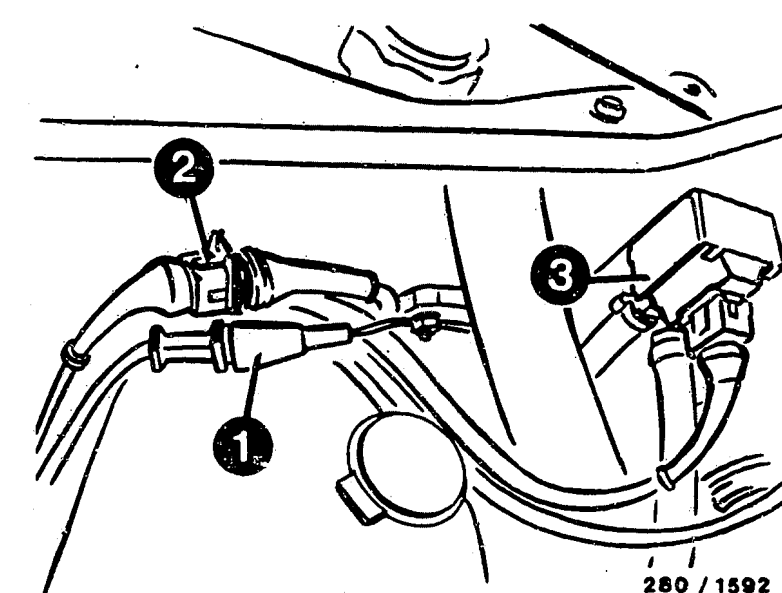
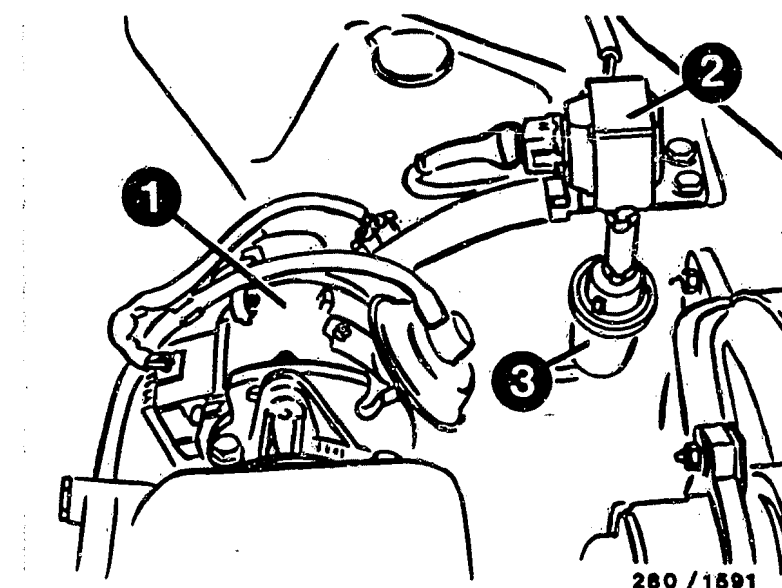
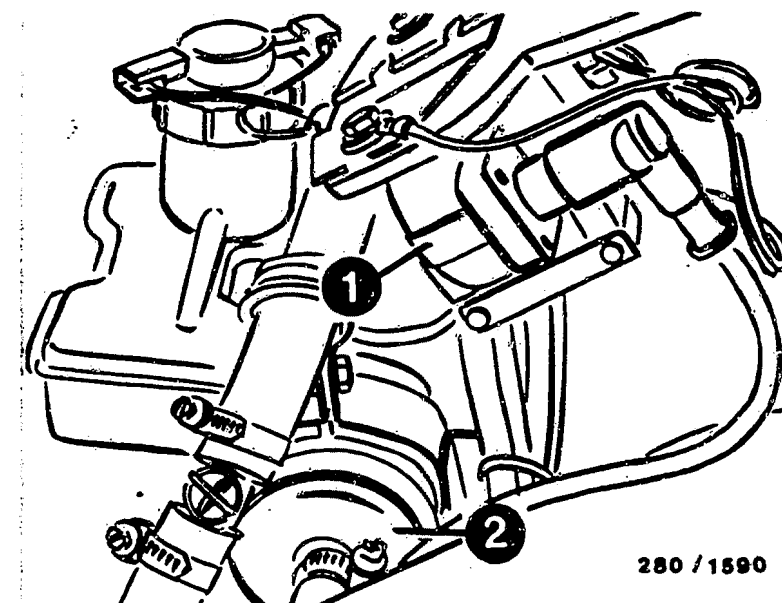
- 1 = Ignition distributor
- 2 = Tank-ventilation switching valve (non-Bosch)
- 3 = Tank-ventilation timing valve

* Bottom picture

- 1 = Plug connection for lambda sensor signal
- 2 = Plug connection for sensor heater
- 3 = Tank-ventilation switching valve

Further installation positions

- * The central ground of the Monojetronic is fitted on the underside at the rear of the engine block.
- * The temperature sensor (engine) is bolted to the rear left of the cylinder head.
- * A 2-pole diagnosis plug for connecting up the Fiat diagnosis tester is located at the control unit.



Trouble-shooting instructions : PEU-5011

BOSCH system : Motronic M 1.3

Make of vehicle : PEUGEOT/CITROEN

Basic microcard : KFZ-00..

TABLE OF CONTENTS

Section	Coordinates
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Structure, usage, safety and precautionary measures	07
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Self-diagnosis test table	09
Test specifications	15
Electrical terminal diagram	19
Installation position of components, notes on removal and installation	23

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models:

PEUGEOT 205 GTI 1.9; 309 GTI; 405 GRI / SRI;
CITROEN BX 19 GTI.
1.9 l /4 cyl. /2 valve engine with 88 kW
(120 bhp) or US models 81 kW (110 bhp)

Engine types: XU 9 JAZ for Europe as of 9.88
XU 9 J2Z for USA, CDN as of 3.88
XU 9 J2Y for CAL as of 3.88

- * Motronic M 1.3 with self-diagnosis.
- * Adaptive Lambda closed-loop control
- * Adaptive tank ventilation with active-carbon container and tank ventilation valve (if provided)
- * One sensor for engine speed and reference mark.
- * Auxiliary-air device (no idle actuator).
- * External ignition output stage (trigger box).
- * The self-diagnosis also includes actuator diagnosis.
Actuator diagnosis makes for active testing of several outputs of the Motronic control unit and the components connected to it including the connecting leads.
On such vehicles the following components are activated by the actuator diagnosis:
1. Injection valves
2. Tank ventilation valves (if provided)
3. Disconnection relay for A/C compressor (envisaged at later date for A/C)

SPECIAL FEATURES (continued)

How to use self-diagnosis:

The self-diagnosis and actuator-diagnosis features are activated and evaluated with the evaluation unit KDAW 9980 (top picture).

Connection of evaluation unit KDAW 9980:

Located in the engine compartment in front of the right-hand spring-strut dome is a black plastic box with one or two 2-pole plugs (as well as injection-valve plugs), main relay, pump relay and pump fuse. Generally speaking, only one connection of the grey plug (if provided) is configured (switched positive).

The green plug is the diagnosis test coupling which is assigned as follows (centre picture):

Term. 1: to control unit term. 55 (serial interface for tester diagnosis)

Term. 2: to control unit term. 13 (stimulation input and flashing-code output)

The evaluation unit is connected as follows:

1. Stimulation button:

Connect socket 4 to diagnosis-test-coupling term. 2 and socket 3 to vehicle ground.

2. Fault lamp:

Socket 1 (red) is either to be connected to the switched positive in the grey plug or directly to the positive terminal of the battery. In view of the fact that stimulation and flashing-code output are effected by way of the same lead, sockets 2 (fault lamp actuation) and 4 are connected to one another.

Note:

If there is a fault lamp in the instrument panel (US models feature the so-called "CARB" lamp e.g. with Peugeot as "check-engine" display), fault output can be tracked via this lamp.

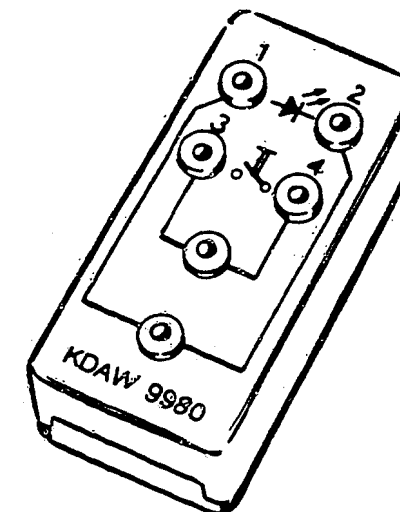
See bottom picture (Peugeot):

Item 1 = Fault lamp in European version

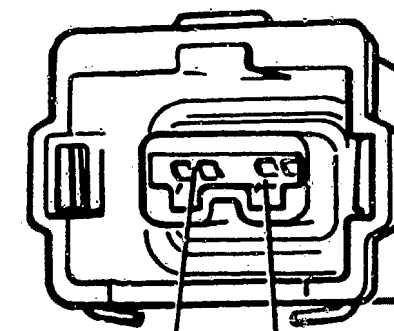
Item 2 = Installation position of fault lamp (CARB) in US version

This lamp lights up when the ignition is switched on and goes out again after starting the engine.

If the lamp does not go out after starting the engine or if it lights when the engine is running, there is a fault in the Motronic.



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KI.1 KI.2

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SPECIAL FEATURES (continued)

Activation of self-diagnosis (fault output):

- Switch on ignition 1 (fault lamp comes on)
- Stimulate for between 2.5 and 10 seconds, i.e. press button of evaluation unit (fault output is thus activated and the fault lamp starts to flash)
- The flashing code 1 2 is always output prior to fault output (start of output)
- Stimulate again for between 2.5 and 10 seconds, so as to read out the 1st fault (if applicable) etc. (each flashing code is only output once until renewed stimulation)
- "1 1" appears as "end of output" message when all stored faults have been output (a maximum of 5) or following "1 2" if the fault memory is empty.
- If stimulation is effected again for between 2.5 and 10 seconds following flashing code 1 1, output commences from the beginning with the start code 1 2
- The fault memory is cleared if stimulation is effected for longer than 10 seconds following flashing code 1 2
Note: the fault memory should be cleared one the causes of the fault on the vehicle have been eliminated

1 =Engine can also be running (n < 2000 min -1)

SPECIAL FEATURES (continued)

Activation of actuator diagnosis:

- First stimulation process (flashing code 9 1: Actuator diagnosis of injection valves). Start with stimulation prior to switch-on of ignition. During stimulation, switch on ignition and terminate stimulation after 2.5 - 10 seconds. Flashing code 9 1 confirms activation of the injection-valve actuator diagnosis. All injection valves should then be heard to be pulsed.
Note:
The valves must be actuated individually to establish whether they are all functioning (disconnect plugs of other injection valves in each case).
- * Caution! In the event of residual fuel pressure, fuel will be injected into the cylinders, which is why activation of this step should be kept as short as possible.
- Second stimulation process (flashing code 9 4: Actuator diagnosis of tank ventilation valve; if provided). Tank ventilation valve is pulsed (can be felt).
- Third stimulation process (flashing code 9 3: Relay actuator diagnosis). Disconnection relay for A/C compressor (if provided) switches periodically (can be heard and felt).
- Fourth stimulation process (flashing code 1 1: Actuator diagnosis completed).

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

- * Avoid injection of fuel and high-voltage flashovers when testing the compression.
Therefore, disconnect Motronic relay.

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems
(engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing
(ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*										Voltage at control unit
*										Engine-speed/reference-mark sensor
*	*			*	*					Fuel pressure
				*						Fuel delivery
*	*			*	*					Solenoid-operated injection valves
	*	*								Idle contact
				*						Full-load contact
	*	*	*	*	*					Air-flow sensor
*	*	*	*							Auxiliary-air device
*	*	*	*							Air-intake system
	*									Idle speed, CO
	*			*						Throttle valve
*	*		*	*						Ignition coil
*	*	*	*	*						Primary signal
	*	*	*	*	*					Secondary pattern
*	*	*	*		*	*	*	*	*	Ignition point
	*	*	*							Interference-suppression resistors
	*	*	*							Noise test
				*						Interference
	*	*								Lambda closed-loop control
*	*	*				*				Tank ventilation
*			*							Ignition trigger box
*	*	*	*	*	*	*	*	*	*	Control unit

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Checking of component/function	Test instructions/test conditions	Terminals	Set values
1 1	End of output			
1 2	Control unit/flashing-code output O.K. (start of output)	Flashing-code output does not function if there is a defect in stimulation lead, fault lamp, connecting leads, plugs or power supply to control unit. Control unit is defective if everything is O.K., but no flashing code is output.	13 15	—
1 3	Temperature sensor (intake air)	Check temperature sensor and lead for short-circuit to ground and open circuit. Temperature sensor resistance: at +15°C...+30°C:	44	— 1450...3300 Ω
1 4	Temperature sensor (engine)	Check temperature-sensor lead for short-circuit to ground and open circuit. Temperature-sensor resistance: at +15...+30°C : at approx. +80°C :	45	— 1450...3300 Ω 280... 360 Ω
1 5 *	Fuel pump relay and output stage at control unit	Fault: short-circuit to ground, to battery voltage or open circuit. Resistance of relay winding (term. 85/86):	3	50... 150 Ω
2 1	Throttle-valve switch/ idle contact	Fault: idle contact always closed. Idle contact closed in off-position: Actuate throttle valve somewhat:	52	approx. 0 Ω infinity Ω

* = Self-diagnosis recognizes this fault only in conjunction with other detected faults.

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions / Test conditions	Term.	Set values
3 1 3 2	Lambda closed-loop control not optimal (Adjustment by way of adaption still possible)	CO content (ahead of catalytic converter). Test intake system for leaks. Fuel pressure outside tolerance. Injection valves defective (e.g. leakage or covered with deposits). Temperature sensor (engine) or (intake air) outside tolerance. Leak in exhaust system (lambda-sensor signal biased) Lambda sensor defective or contact resistance in lead (including poor ground). Tank ventilation valve defective (e.g. permanently open).	—	—
3 3	Air-flow sensor	Test air-flow-sensor leads for continuity and short-circuits (to ground, to battery voltage and with respect to one another). Watch out for worn cable insulation and loose contacts! Measure resistances of air-flow sensor between term. 2 and term. 4 (change in resistance when sensor flap deflected): between term. 3 and term. 4:	7 12 26	— 8...2500 Ω 300...550 Ω
3 4	Tank ventilation valve and output stage in control unit	Fault: Short-circuit to ground or to battery positive Test lead for contact with ground or battery positive. If O.K., control unit is defective. Winding resistance at +15...+30°C:	5	35...55 Ω
3 5	Throttle-valve switch/ full-load contact	Fault: Full-load contact permanently closed. Fault lamp (if fitted) may light up occasionally during overrun. Full-load contact closed in full-throttle position: Release accelerator pedal somewhat:	53	approx. 0 Ω infinity Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Checking of component/function	Test instructions/test conditions	Terminals	Set values
4 2	Injection valves and injection output stage(s) in control unit	Possible causes of trouble: 1. Short-circuit to ground/battery voltage or open circuit in one or both actuation leads (term.16/17) 2. Short-circuit to ground (or open circuit in joint positive lead (for both valve groups). 3. Control unit and/or injection valves defective.	16 17	7... 9 Ω (2 valves in parallel) 15...17,5 Ω (1 injection valve)
5 1	Lambda sensor	Open circuit/short-circuit to ground or UB in lead or Lambda sensor. Pay attention to worn insulation! Sensor heater defective. Sensor clogged.	28	—
5 2	Lambda closed-loop control on rich or lean stop (adaption also at stop)	CO content (ahead of catalytic converter): Major leak in intake system. Check fuel pressure: Injection valves defective.	—	0,7 \pm 0,3 vol.% 2,8...3,2 bar
5 3	Supply voltage for control unit too low or too high (with engine running)	Supply voltage: Check voltage dips at positive and ground terminal. Charge battery, check alternator system.	18 19 (+) (-)	10...16 V
5 4	Control unit/digital section	Control unit defective	—	—
6 7 (US mod. only)	Fault lamp with lamp output stage (control unit)	Fault: short-circuit to ground or to UB.	15	—

TEST SPECIFICATIONS

* Pressure regulator

Fuel pressure: 2,8...3,2 bar

* Electric fuel pump

Delivery
(measured in return): min. 675 cm³ /30s
Supply voltage
(under load): min. 12 V

* Temperature sensor (air)

Internal resistance
measured at air-flow sensor
between term. 5 and term.4
at ambient temperature
(+15°C...+30°C): 1450...3300 Ω

* Temperature sensor (engine) (plug colour blue)

Internal resistance
at ambient temperature
(+ 15° C...+ 30° C): 1450...3300 Ω
Engine at operating temperature
(approx. + 80° C): 280...360 Ω

* Air-flow sensor

Internal resistance at
term.2 and term.4 : 8...2500 Ω (1)
term.3 and term.4 : 300... 550 Ω

(*) Slowly deflect sensor flap as far as
it will go.
Fluctuating increase in resistance;
drops off slightly towards end.

TEST SPECIFICATIONS (continued)

* Engine-speed/reference-mark sensor

Internal resistance
at ambient temperature
(+15°C...+30°C): 400...800 Ω
Air gap: 0,8 ± 0,5 mm

* Throttle-valve switch

Resistance value of idle contact
(term.1 and term.2): approx. 0 Ω
Resistance value of full-load
contact (term.3 and term.2): approx. 0 Ω

* Solenoid-operated injection valve

Internal resistance
at ambient temperature
(+ 15° C...+ 30° C): 15...17,5 Ω

* Trigger box (output stage)

Supply voltage at
term.4 and term.2 : 12...14 V,
(with engine idling): max. 1 V below
battery voltage
Supply voltage at
term.4 and term.2 : battery voltage
(with ignition ON)
Control signal at
term.5 and term.2 : rectangular pulses

* Auxiliary-air device

Internal resistance 35 ... 70 Ω

* Ignition coil

Primary resistance: 0,5... 0,9 Ω
Secondary resistance:
Bar-type coil 4,3... 7,7 k Ω
Plastic coil 6,6...12,1 k Ω

TEST SPECIFICATIONS (continued)

* Idle test

Engine at operating temperature,
switch off loads.

Idle speed: 850...900 min ⁻¹

Ignition angle: 4 ± 5 °CS

Note:

If TDC sensor installed (3-pole connector), make use of
diagnosis lead 1 684 465 188 for measuring ignition
angle.

* CO content

ahead of catalytic converter
(if sampling point provided): 0,7 ± 0,3 vol.% CO

downstream of cat. convert.
(tailpipe) approx. 0 vol.% CO

* Lambda sensor

Heater-winding resistance: 1...15 Ω

* Tank ventilation valve

Internal resistance at
+15°C...+30°C: 35...55 Ω

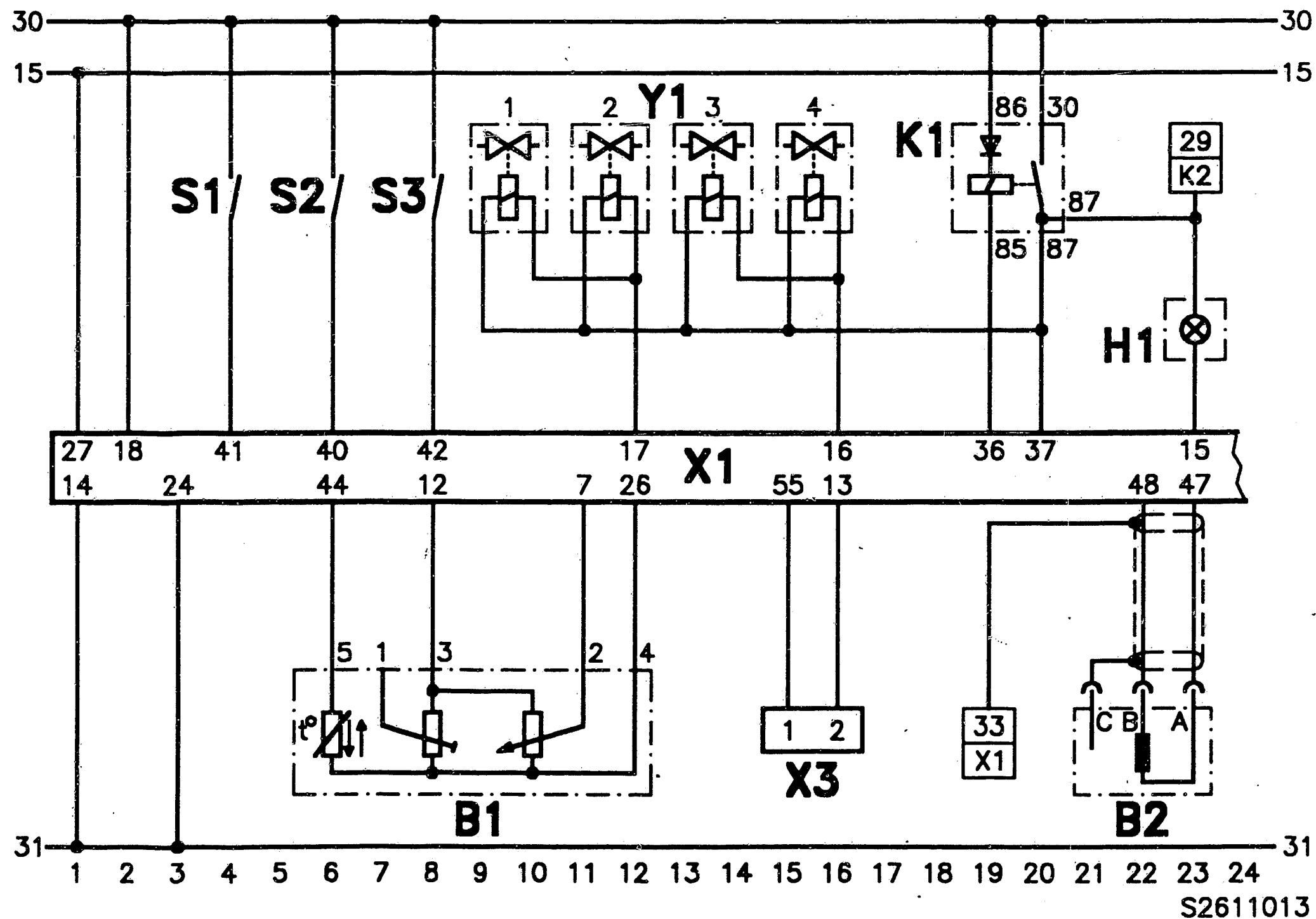
* Interf.-suppression resistors

High-tension distributor rotor: 1 k Ω

The secondary side of the ignition system must be
provided with interference suppression of at least
5 k Ω overall resistance. High-voltage resistance
leads are fitted as standard.

Please refer to equipment and Autodata microcard
for settings as regards valve clearance and other
engine-related data.

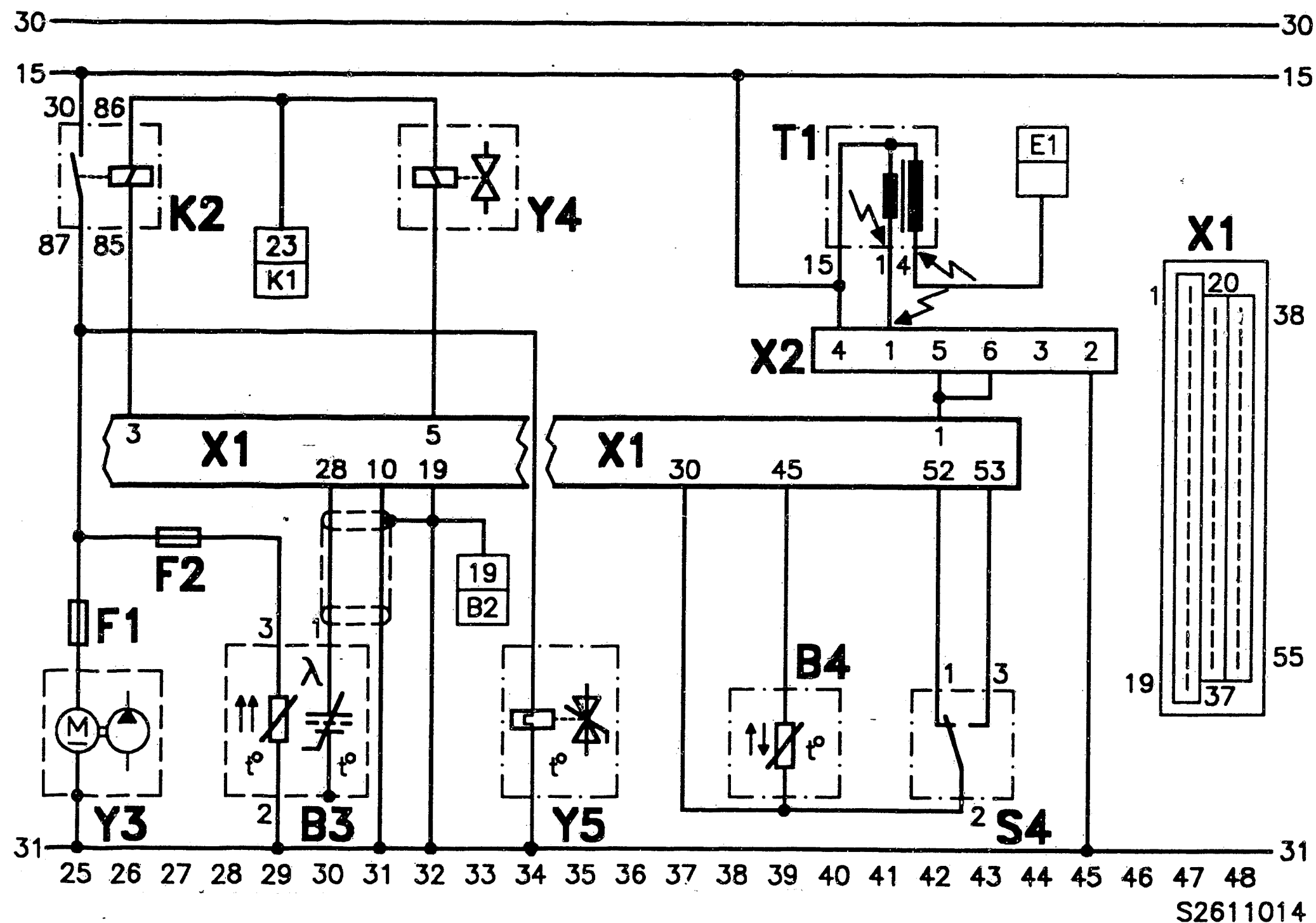
For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

B1 = Air-flow sensor
 B2 = Engine-speed/reference-mark sensor
 H1 = Fault lamp (if provided)
 K1 = Main relay
 K2 = Pump relay
 S1 = Switch, A/C readiness
 (if A/C provided)

S2 = Switch on A/C compressor
 (if A/C provided)
 S3 = Switch on driving position switch
 (in the case of automatic)
 X1 = Motronic control-unit plug
 X3 = Diagnosis test coupling
 Y1 = Solenoid-operated injection valves



ELECTRICAL TERMINAL DIAGRAM (CONTINUED)

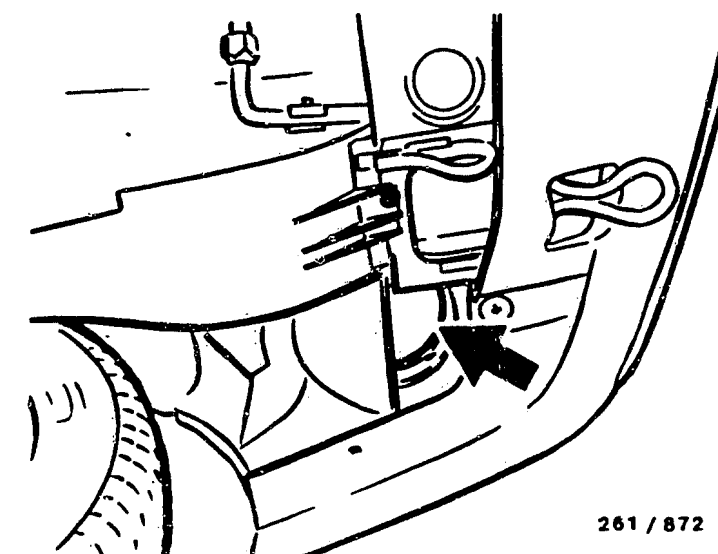
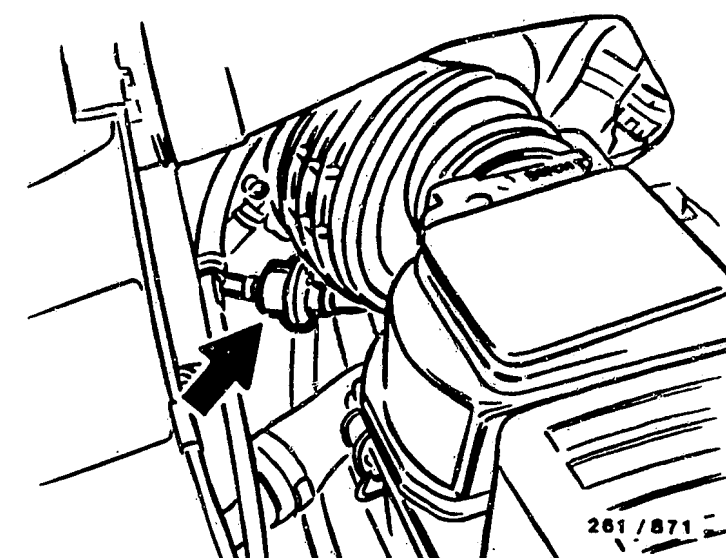
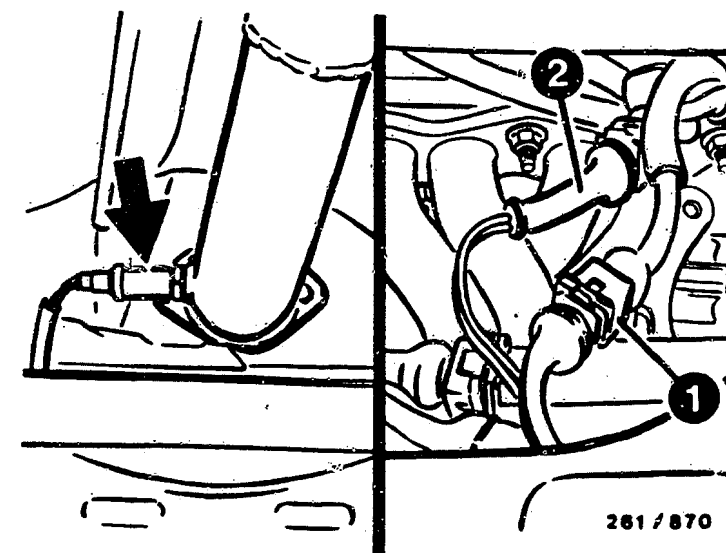
B3 = Heated Lambda sensor
 B4 = Coolant temperature sensor
 E1 = H.T. distributor
 F1 = Pump fuse (10 A)
 F2 = Sensor-heater fuse
 K1 = Main relay
 K2 = Pump relay

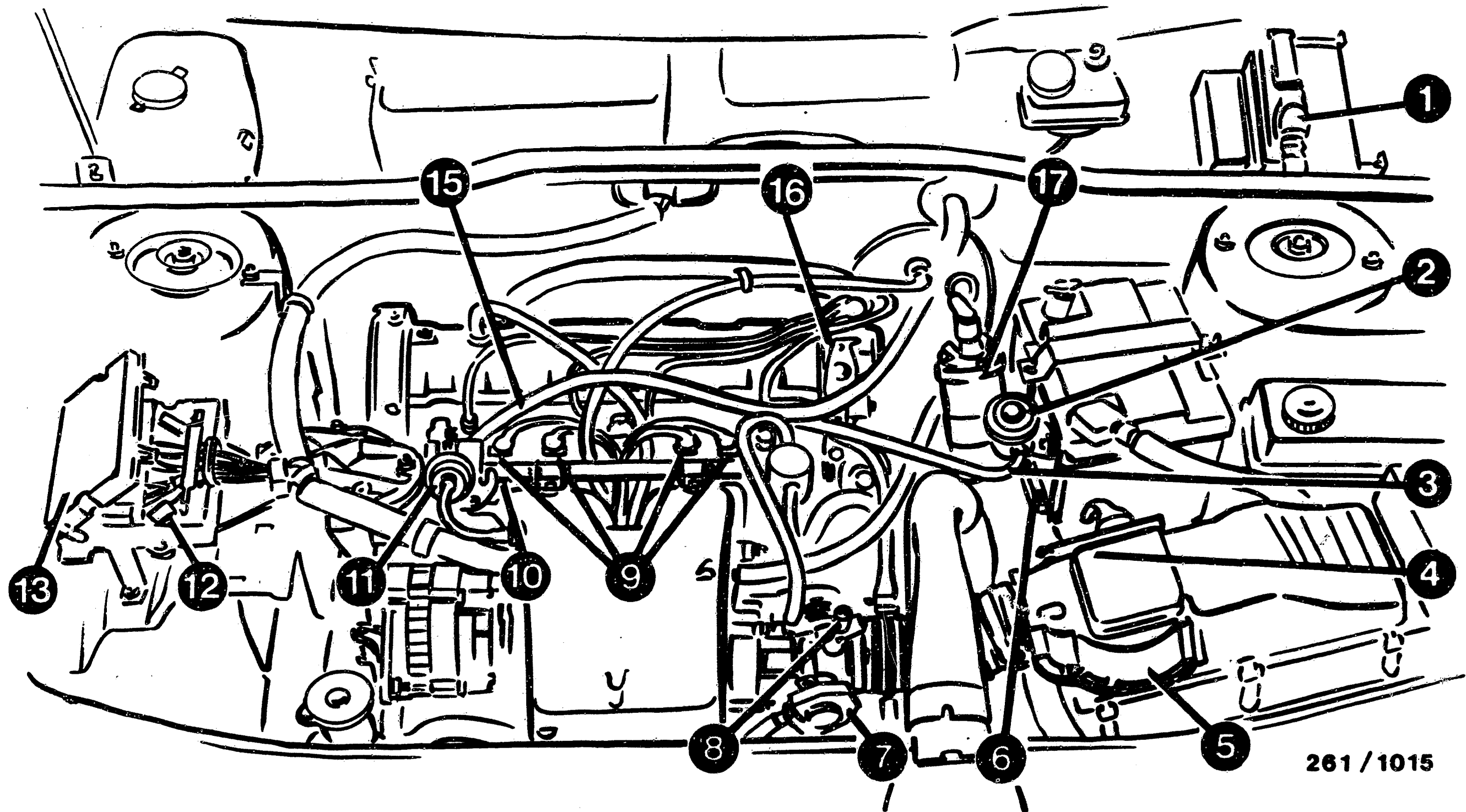
S4 = Throttle-valve switch
 T1 = Ignition coil
 X1 = Motronic control-unit plug
 X2 = Ignition-trigger-box plug
 Y3 = Electric fuel pump
 Y4 = Tank ventilation valve
 Y5 = Auxiliary-air device

INSTALLATION POSITION OF COMPONENTS (continued)

The installation locations always refer to the direction of travel.

- * Electric fuel pump and fuel filter:
Beneath vehicle between fuel tank and rear axle.
Otherwise pump in tank in the event of in-tank electric fuel pump (access via cover beneath rear seat bench)
- * Lambda sensor:
Screwed into exhaust system ahead of catalytic converter (picture top left, arrow).
- * Plug connection to lambda sensor:
Beneath vehicle.
Picture top right:
Item 1 = Sensor signal
Item 2 = Sensor heater (white leads)
- * Tank ventilation valve:
Ahead of engine (centre picture, arrow).
- * Active-carbon container:
Beneath vehicle, ahead of left-hand front wheel house (bottom picture, arrow).
- * Fuse box (Peugeot):
In instrument panel, bottom left.
Top of fuse box can be swivelled out.
- * Temperature sensor (intake air):
In air-flow sensor.
- * Engine-speed/reference-mark sensor:
On left in engine block, beneath high-tension distributor.
- * Temperature sensor (engine):
Screwed into engine block, in vicinity of engine-speed/reference-mark sensor.
- * Throttle-valve switch:
On side of throttle-valve assembly.
- * Auxiliary-air device:
In bypass to throttle valve.





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INSTALLATION POSITION OF COMPONENTS (Peugeot 405 SRI)

- 1= Motronic control unit
- 2= Fuel pressure damper
- 3= Fuel inlet hose
- 4= CO potentiometer (no function with cat)
- 5= Air-flow sensor
- 6= Ignition trigger box

- 7= Throttle-valve switch
- 8= Idle-speed adjustment screw
- 9= Injection valves
- 10= Fuel distributor
- 11= Pressure regulator
- 12= Diagnosis test coupling

- 13= Electrics box with main relay (5-pole), pump relay, pump fuse, diagnosis test coupling
- 15= Fuel return hose
- 16= H.T. distributor
- 17= Ignition coil

Basic microcard : KFZ-00..

Section	Coordinates
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Special features	02
Structure, usage	02
Safety and precautionary measures	02
Test requirements	03
Rapid diagnosis chart	05
Test specifications	19
Electrical terminal diagram	21
Installation position of components, notes on removal and installation	23

This microcard contains trouble-shooting instructions, valid at the time of publication, for the following models:

RENAULT Espace	10.88	->
RENAULT Espace Quadra (4-WD)	10.88	->

- * ABS with 4 wheel-speed sensors and 4 hydraulic channels.
- * Number of teeth on sensor ring gears: 48
- * Longitudinal acceleration switch (a_L) for 4-WD vehicles.

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

For a detailed description of trouble-shooting, see the basic instructions.

The set values, terminal assignments and special features of these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

- * For safety reasons, the hydraulic modulator must not be repaired, but be exchanged as a complete unit.
Exception: relays.
- * Do not loosen any screws on the hydraulic modulator!
Danger of fatal accident due to brake failure.
- * Caution when handling brake fluid.
Poisonous!

For further information, see basic instructions.

TEST REQUIREMENTS FOR TESTING WITH ABS2 LED TESTER

- * Regulatory tire size fitted?
- * Check for firm seating of ground of return-supply pump.
- * Check for firm seating and corrosion of ground of overvoltage-protection relay term. 31.
- * Check for firm seating of ground strap between engine block and vehicle frame.
- * Check for leaks in hydraulic connections at hydraulic modulator and sealing points (visual examination).
- * If the ABS warning lamp lights up intermittently when driving (e.g. after switching on loads) and goes out again by itself, check the battery and power supply (alternator, regulator and voltage drops).
- * If the ABS warning lamp lights up constantly and does not go out, check the following points:
 - Controller plug sitting correctly on controller and latched?
 - All plug contacts O.K.?
 - Spring contacts latched?
 - Check installation position for correct seating of seal ring in controller plug. rounded side downward.

- Check wheel-speed-sensor leads for correct assignment at controller plug:

Wheel-speed sensors:

front left to term. 5 (22) and term. 4.
front right to term. 11 and term. 21.
rear left to term. 7 and term. 9.
rear right to term. 24 and term. 26.
rear axle to term. — and term. —.

- V-belt snapped?
(Alternator provides no voltage, charge-indicator lamp and ABS warning lamp light up).
- * Connect ABS 2 LED tester to ABS wiring harness.
- Disconnect and connect controller only with ignition switched off.
- For testing, switch on ignition in all program-selector-switch positions (tester operates with current supply from vehicle battery).
- Observe LED (green) for current supply in all program-selector-switch positions.

C A U T I O N !

Do not drive with tester connected!
The brake system must be bled of air before the ABS test. Do not activate the ABS tester while the system is being bled.
Repeat the complete test program after any repairs are carried out.
The Antiskid System is a vehicle safety system.
Work on the system demands detailed knowledge of the system.
The conventional brake system must be O.K.

General information for trouble-shooting:

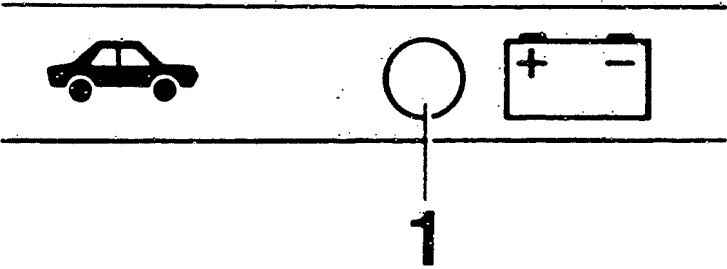
Check all leads for short circuit to ground and contact with positive leads and watch out for worn cable insulation and pinched leads.

RAPID DIAGNOSIS CHART

Never drive with tester connected! Have all test prerequisites been met?

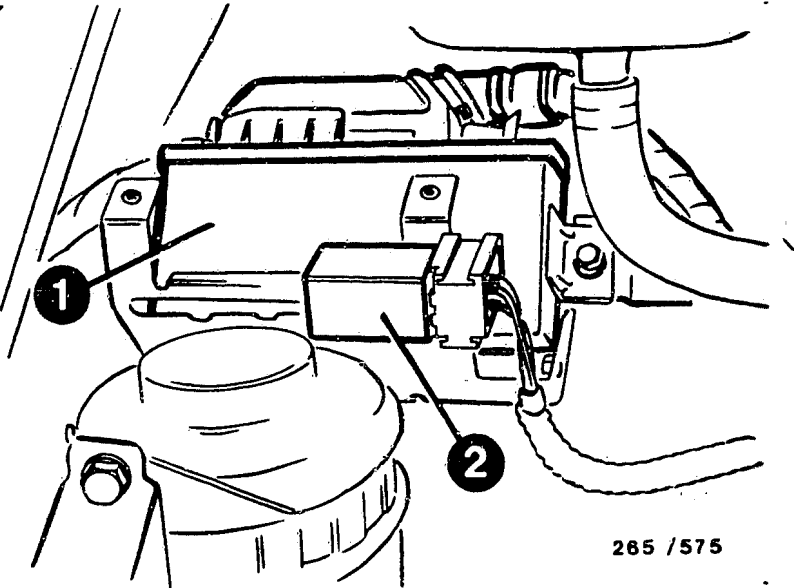
Program-selector-switch positions 1 - 6

Testing of (measurement at terminals)	Additional operation	Test specification (indication)	Possible causes of trouble
Voltage supply (Term.1 and term.20)	Ignition on	LED 1 (Top picture) lights up constantly	<ul style="list-style-type: none">* Battery not sufficiently charged* Excessive voltage dips.* Check leads from relay plug to controller term.1, to driving switch term.15, to battery B+ and to ground terminal. Check ground lead to controller term.20.* Over-voltage protection relay defective.



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1 = ABS controller
2 = Over-voltage protection relay

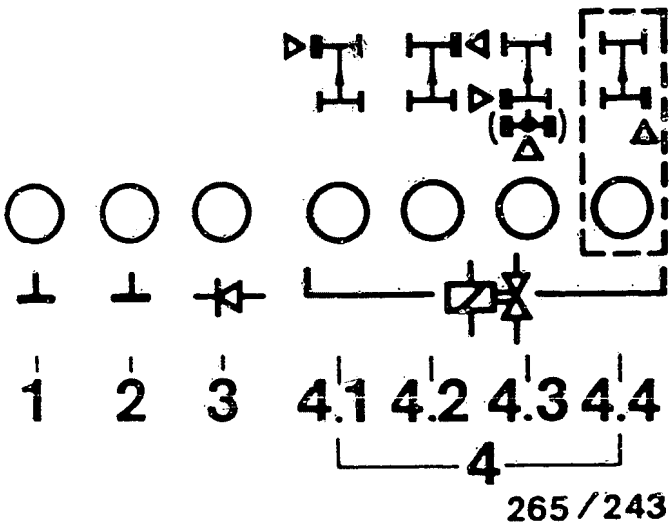


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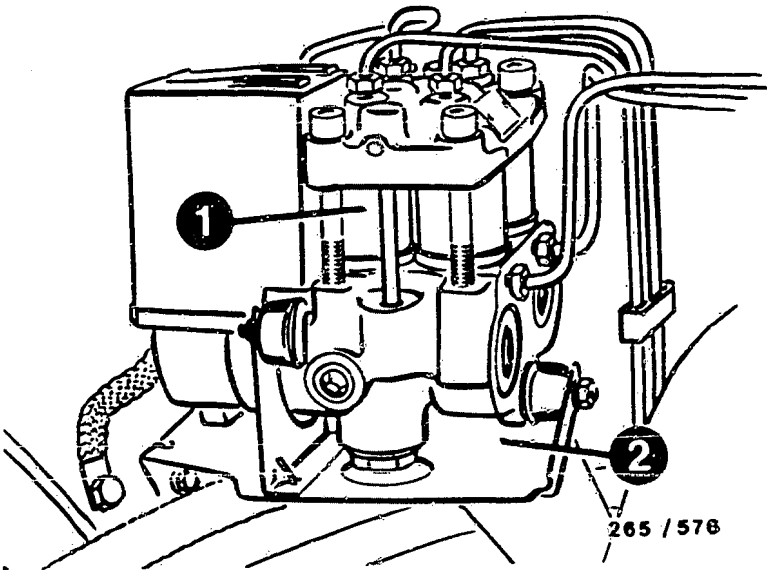
RAPID DIAGNOSIS CHART (CONTINUED)

Program-switch position 1 (4-channel hydraulic modulator)

Testing of (measurement at terminals)	Addition- al operation	Test specifi- cation (reading)	Possible causes of faults
Ground connection (term.10, term.34) Diode for warning lamp (term.29, term.32) Solenoid-operated valve internal res. (term.2, term.18, term.19, term.35) Off-position and ground connection of relay ABS warning lamp	Ignition on	7 LED (1 to 4.4) simultaneously brightly lit (top picture) ABS warning lamp in vehicle must light up	<ul style="list-style-type: none">* LED 1 and/or 2 (top picture) not lit: Check ground terminals for open circuit.* LED 3 (top picture) not lit: Diode defective, check ground connection of valve relay.* One or more LEDs 4 not lit: Check corresponding plug-in connection for solenoid- operated valve and leads.Solenoid-operated valve internal resistance 0,7...1,7 Ω* All LEDs 4 and LEDs 3 not lit: Check ground connection of valve relay, valve relay defective.* Dimmer lighting-up of an LED means contact resistance in the corresponding circuit.* ABS warning lamp not lit: Warning lamp defective. Note: all other 6 LEDs lit.



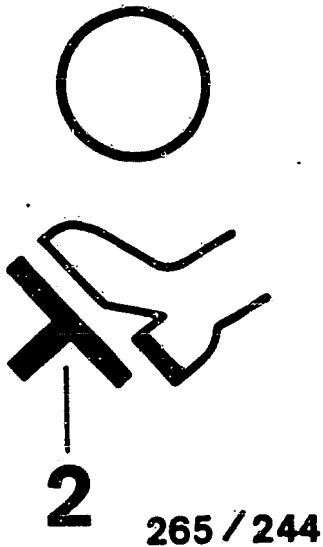
1 = Hydraulic modulator
2 = Mount



RAPID DIAGNOSIS CHART (CONTINUED)

Program-selector-switch position 2

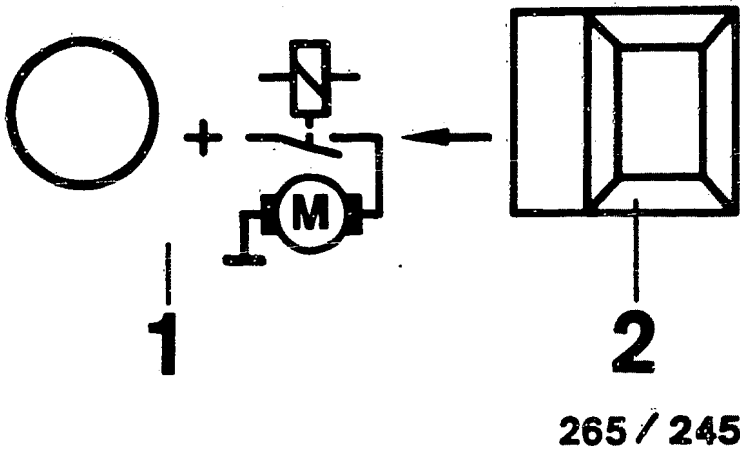
Under test (Measurement at the terminals)	Addition- al operation	Test specifi- cation (reading)	Possible causes of trouble
Alternator voltage from term. 61/D+ (term. 15)	Ignition on	LED 1 (top picture) lit.	* In some cases, LED does not go out until after burst of throttle (test is O.K. in this case).
	Start engine	LED 1 (top picture) goes out when engine running	* Test lead and signal from alternator term. 61/D+ * Alternator defective.
Stop-lamp switch (term.25)	Ignition on	LED 2 (top picture) lit	* Stop-lamp switch defective. * Check lead to stop-lamp switch.
	Press brake pedal	LED 2 (top picture) goes out	* Lead incorrectly connected to to stop-lamp switch.



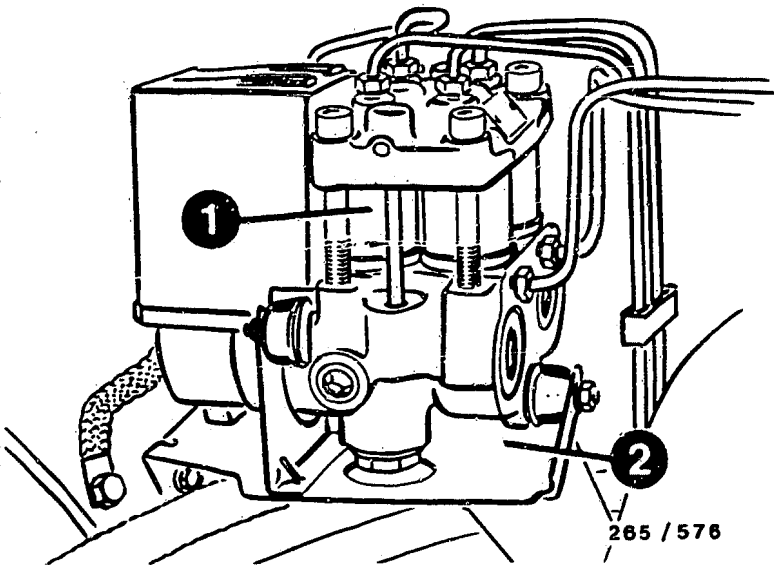
RAPID DIAGNOSIS CHART (CONTINUED)

Program-selector-switch position 3

Testing of (measurement at terminals)	Additional operation	Test specifi- cations (indication)	Possible causes of trouble
Motor relay, pump motor in hydraulic modulator (term.14 and term.28)	Ignition on, press button 2 continuously (Top picture)	LED 1 lights up, pump motor runs. After releasing button, LED lights up as a result of motor run-on (top picture).	<ul style="list-style-type: none">* Motor relay defective* Check ground connection and positive terminal of pump motor* Check following leads: From controller term.14 and term.28 to hydraulic modulator term.9 and term.11. Positive leads to hydraulic modulator term.2 and term.13.* Pump motor or hydraulic modulator defective.



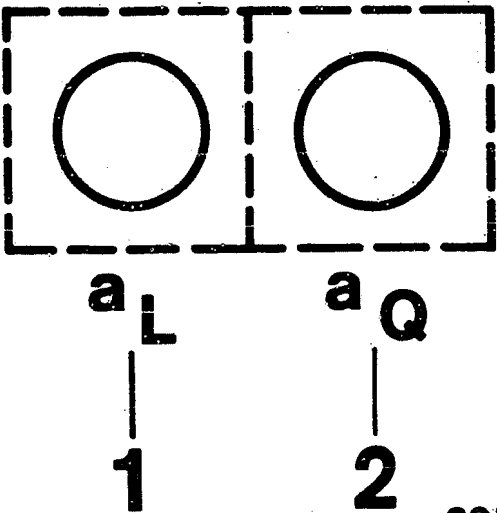
1 = Hydraulic modulator
2 = Mount



RAPID DIAGNOSIS CHART (CONTINUED)

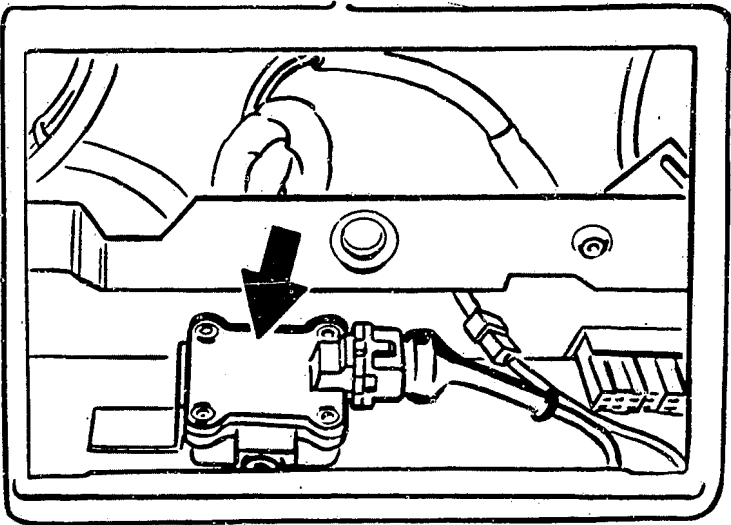
Program-selector-switch position 4

Testing of (measurement at terminals)	Addition- al operation	Test specifi- cation (indication)	Possible causes of trouble
Acceleration switch a L (term.16)	Ignition on	LED a L lights up	<ul style="list-style-type: none">* Check acceleration switch: resistance: 500...670 Ω
			<ul style="list-style-type: none">Pay attention to correct install- ation position when fitting switch: Arrow in direction of travel.* Check lead from acceleration switch to ABS controller term.16.* Check lead from controller term.1 to acceleration switch.



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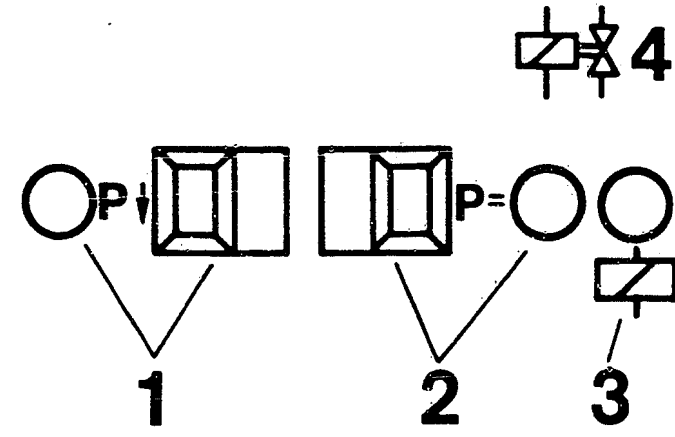
Arrow = Acceleration switch



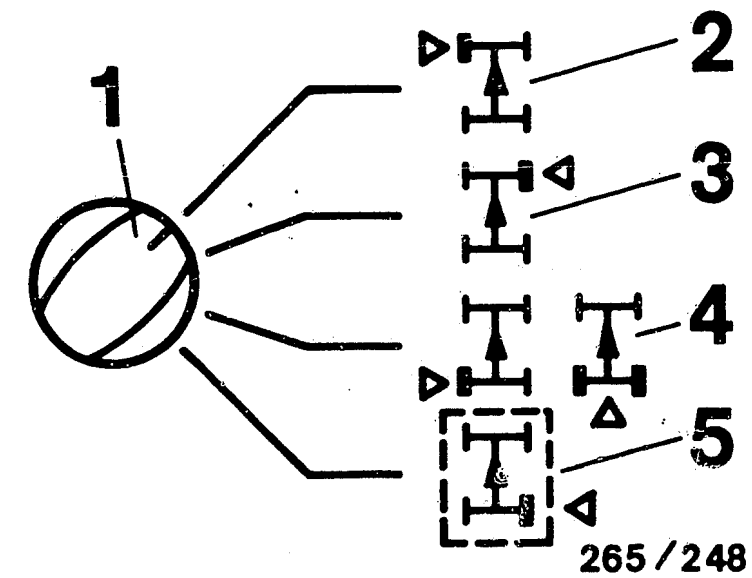
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RAPID DIAGNOSIS CHART (CONTINUED)
Program-selector-switch position 5 (4-channel hydraulic modulator)

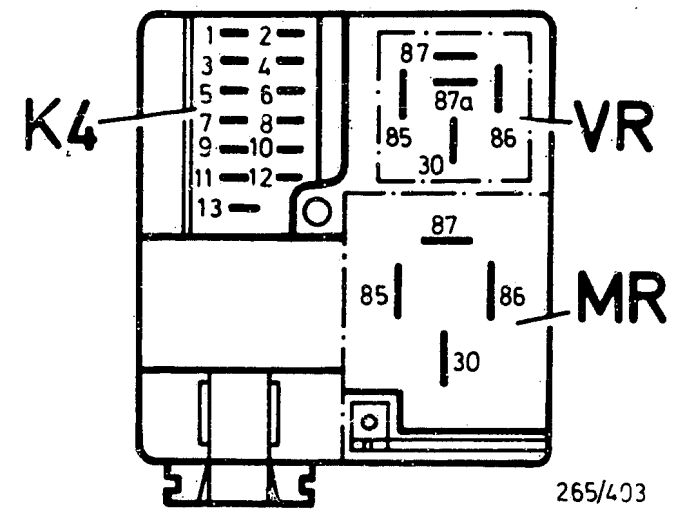
Under test (measurement at the terminals)	Additional operation	Test specification (reading)	Possible causes of trouble
Valve relay operation (term. 27)	Ignition on	LED 3 (upper illustration) lights up	* Valve relay (winding) or leads defective
Solenoid-operated valves in hydraulic modulator for operation and mix-up. NOTE: Check each wheel separately in turn. Keep to operating sequence.	Chock up vehicle. Ignition on. The wheel being tested must be freely turnable by hand. Set switch 1 for wheel selection to wheel to be tested (center illustration).		* Repeat test with engine running * Valve relay (make contact) defective
	1. Constantly press push-but. P = (upper illustration) 2. Constantly press brake pedal 3. Release push-button P = (upper illustration)	LED P= (upper illustration) lights up Wheel turnable by hand LED P= goes out (upper illustration) Wheel locks	* Break in lead from valve relay term. 87 to B+ * Brake leads at hydraulic modulator mixed up
Operation, pressure holding	4. Press push-button P arrow (upper illustration)	LED P arrow (upper illustration) lights up, wheel turnable by hand	* Current value not obtained (LED P arrow or P= goes out; upper illustration): battery insufficiently charged. Repeat check with engine running.
	5. Release push-button P arrow (upper illustration)	LED P arrow (upper illustration) goes out, wheel locks	
	6. Release brake pedal		
Operation, pressure reduction			* Solenoid-operated valves correctly connected electrically? Wheel, front left: term. 2 Wheel, front right: term. 35 Wheel, rear left: term. 18 Wheel, rear right: term. 19 Rear axle: term. -
			* Hydraulic modulator defective



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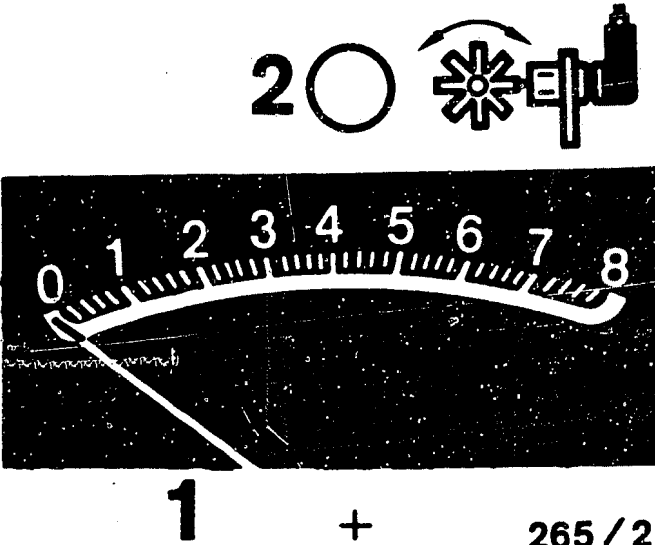
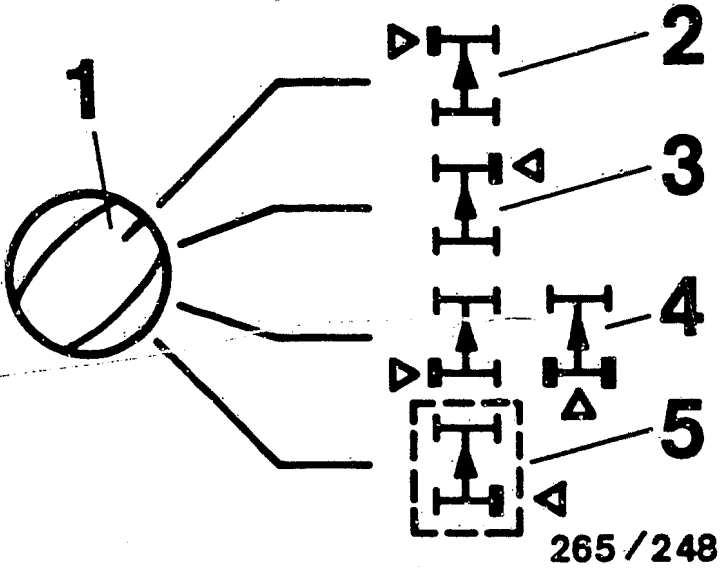


265/403

RAPID DIAGNOSIS CHART (CONTINUED)

Program-selector-switch position 6 (4 wheel-speed sensors)

Under test (measurement at the terminals)	Additional operation	Test specification (reading)	Possible causes of trouble
<p>Wheel-speed sensor for operation and mix-up</p> <p>NOTE: Check each wheel separately in turn.</p> <p>Wheel, front left: term.4 and t.5(22)</p> <p>Wheel, front right: term.11 and term.21</p> <p>Wheel, rear left: term.7 and term.9</p> <p>Wheel, rear right: term.24 and term.26</p>	<p>Chock-up vehicle. Ignition on.</p> <p>The wheel being tested must be freely turn- able by hand.</p> <p>When testing the driven axle, the wheel not being tested must be locked.</p> <p>Set switch for wheel selection to wheel to be tested (lower illustration)</p> <p>Turn wheel by hand until LED 2 above instrument lights up without flickering. (Wheel speed approx. 1 revolution per second). Afterwards, read off indication at instrument: (upper illustration)</p>	<p>1. Smallest reading larger 1,6 divisions</p> <p>2. Permissible fluctuation max. 25 % of largest reading.</p>	<p>*Wheel-speed-sensor lead mixed up</p> <p>*Brake in wheel-speed- sensor lead</p> <p>*Wheel-speed sensor defective</p> <p>Winding resistance Front axle: 0,6...1,6 k Ω</p> <p>Rear axle: 0,6...1,6 k Ω</p> <p>*Air gap between wheel- speed sensor and ring gear too wide</p> <p>*Ring gear defective (e.g. corroded, dirty) or loose.</p> <p>*Ring gear with incorrect number of teeth installed Front axle: 48 teeth Rear axle: 48 teeth</p> <p>*Wheel-bearing clearance too large</p> <p>*Instrument gives reading, LED 2 does not light up: loose contact in wheel- speed sensor lead.</p>



TEST SPECIFICATIONS

Wheel-speed sensor

- * Winding resistance at ambient temperature (-10°C...+120°C) for front wheels: 600...1600 Ω
- rear wheels: 600...1600 Ω

Hydraulic-modulator solenoid valves

- * Winding resistance at ambient temperature (-10°C...+120°C): 0,7... 1,7 Ω

Air gap between wheel-speed sensor and ring gear

- * at front wheels: 0,1...0,8 mm
- * at rear wheels: 0,1...1,3 mm

Tightening torque for

- * fastening screws of wheel-speed sensors: > 8 Nm
- * Brake-line connections at hydraulic modulator: 12...16 Nm
- * Fastening screws for wheel-speed-sensor mount
 - at front wheels: 25 Nm
 - at rear wheels: 40 Nm

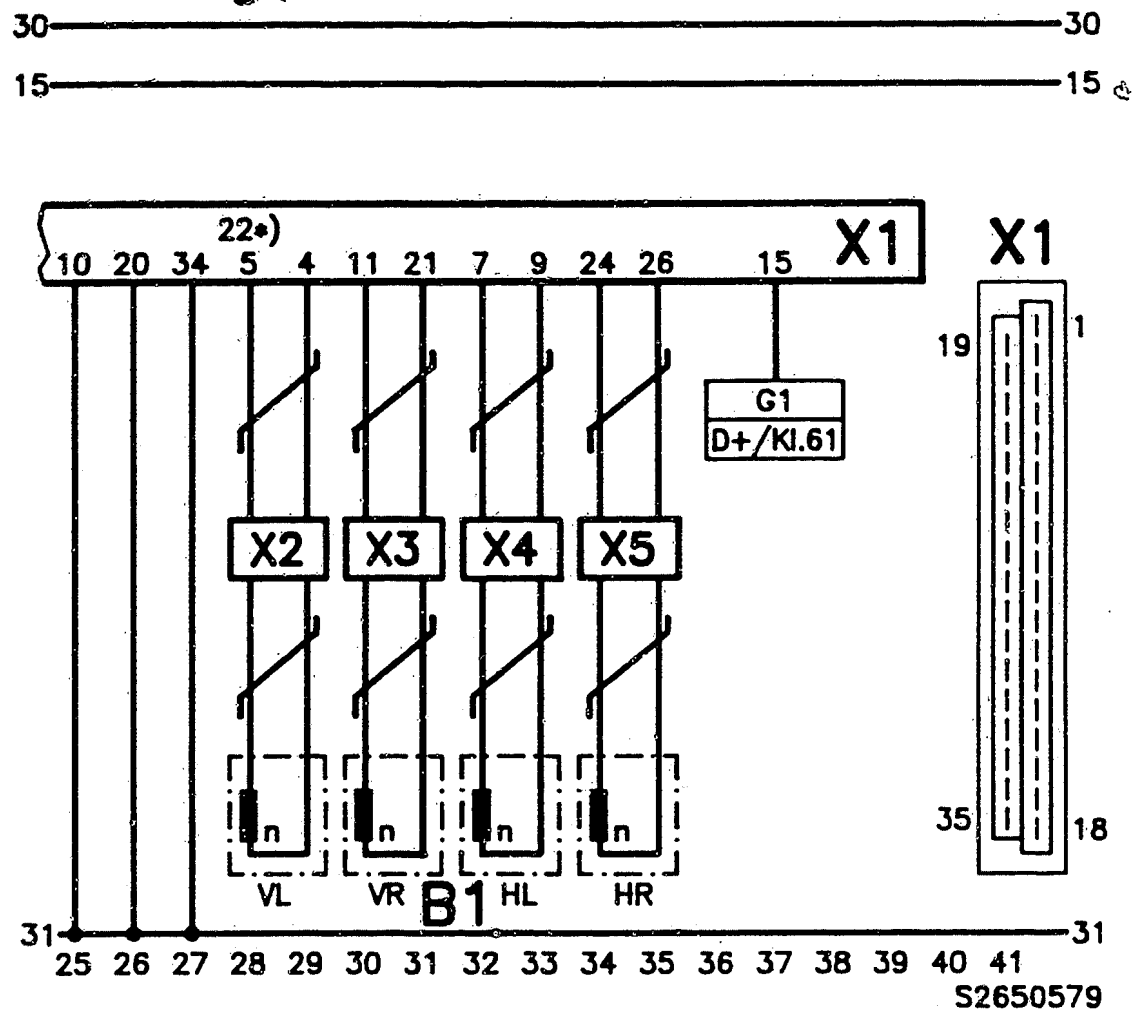
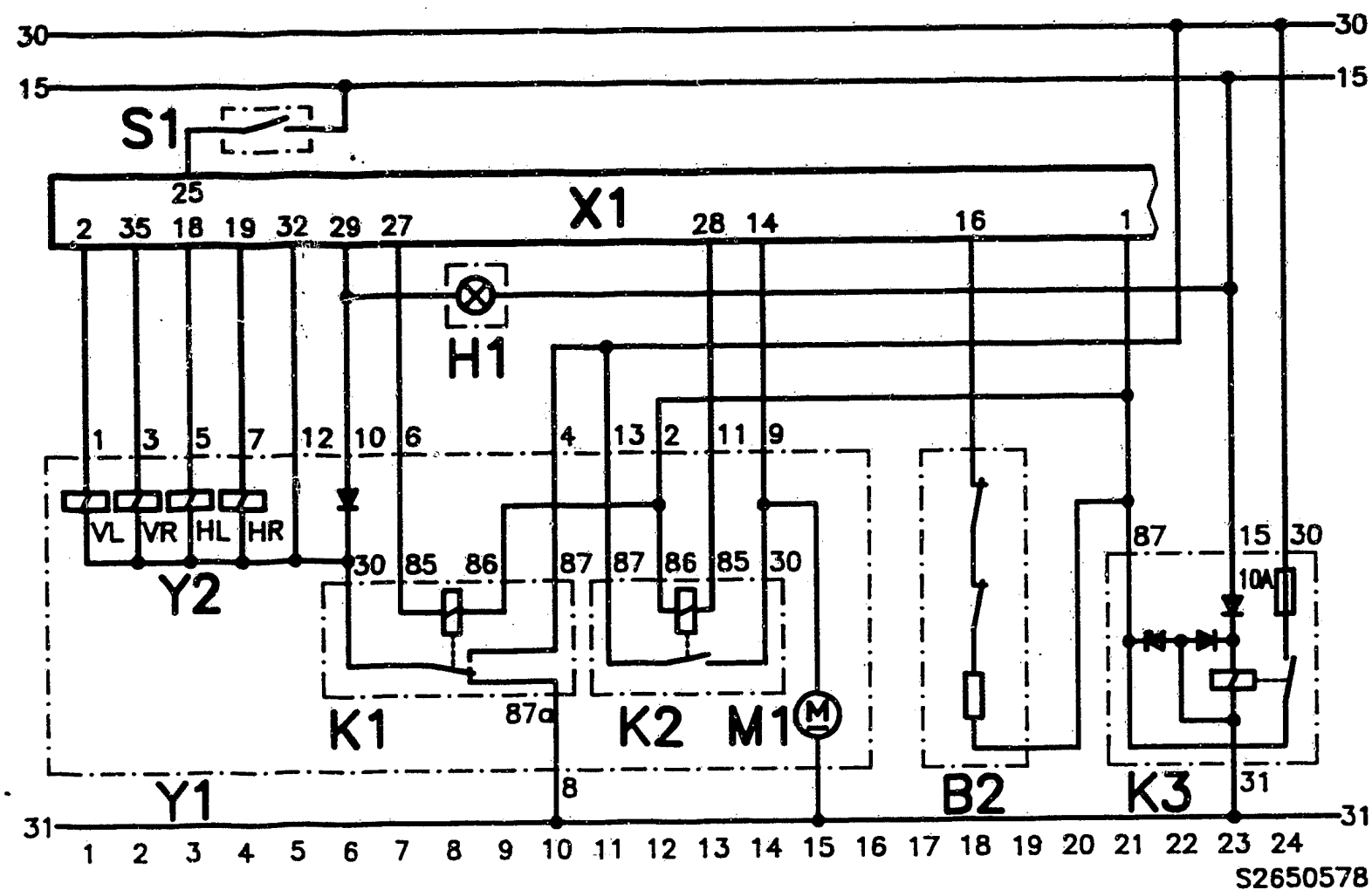
Number of teeth on wheel-speed-sensor ring gears

- * at front wheels: 48 teeth
- * at rear wheels: 48 teeth

Lateral acceleration sensor

- * Contacts closed in horizontal position: 500... 670 Ω

For production reasons:
continued on the following
coordinate.

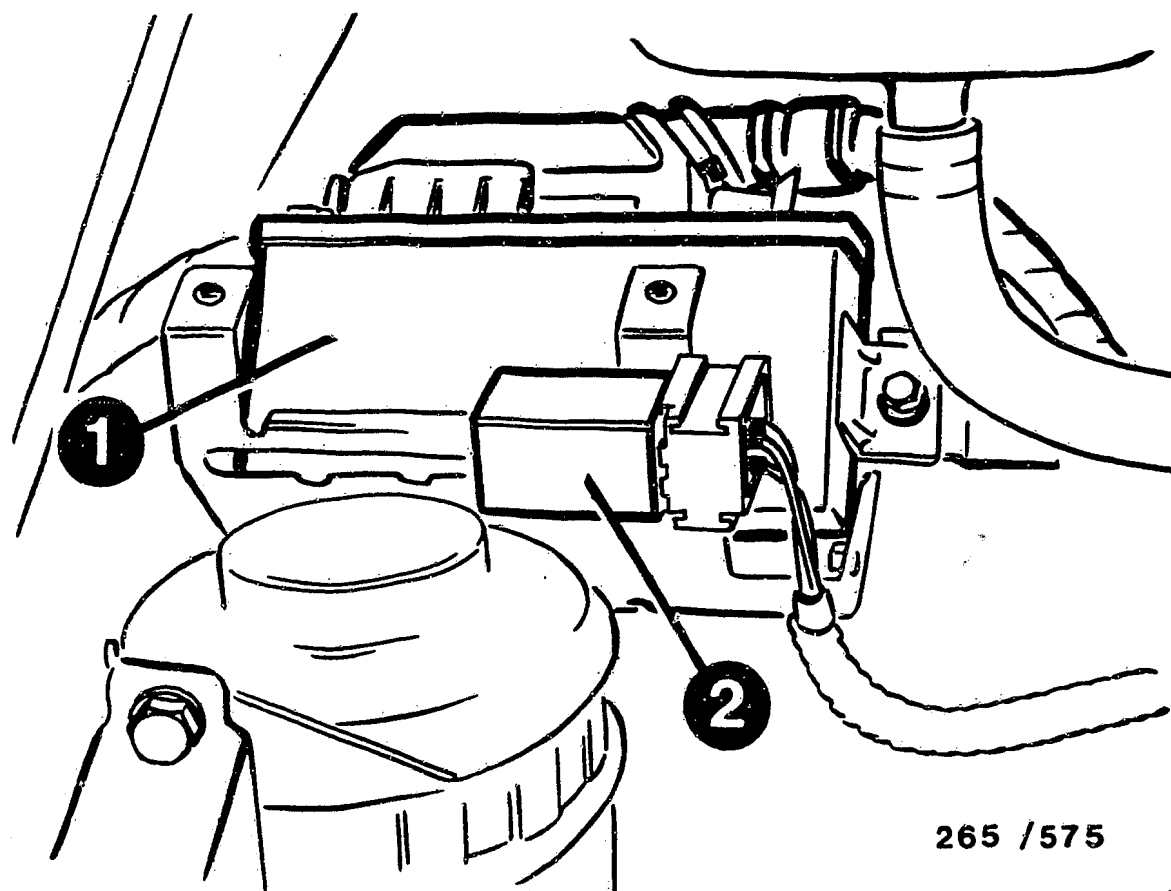


ELECTRICAL TERMINAL DIAGRAM

B1 = Wheel-speed sensor
 B2 = Acceleration switch
 (4-WD only)
 G1 = to alternator via
 charge indicator lamp
 H1 = ABS warning lamp
 K1 = Valve relay

K2 = Engine relay
 K3 = Over-voltage protection
 relay
 M1 = Return pump motor
 S1 = Stop-lamp switch
 X1 = Controller plug (35-pole)
 X2...X5 = Wheel-speed-sensor plugs

Y1 = Hydraulic modulator
 Y2 = Solenoid valves
 HL = Rear left
 HR = Rear right
 VL = Front left
 VR = Front right
 *) = Term.22 applies to 4-WD

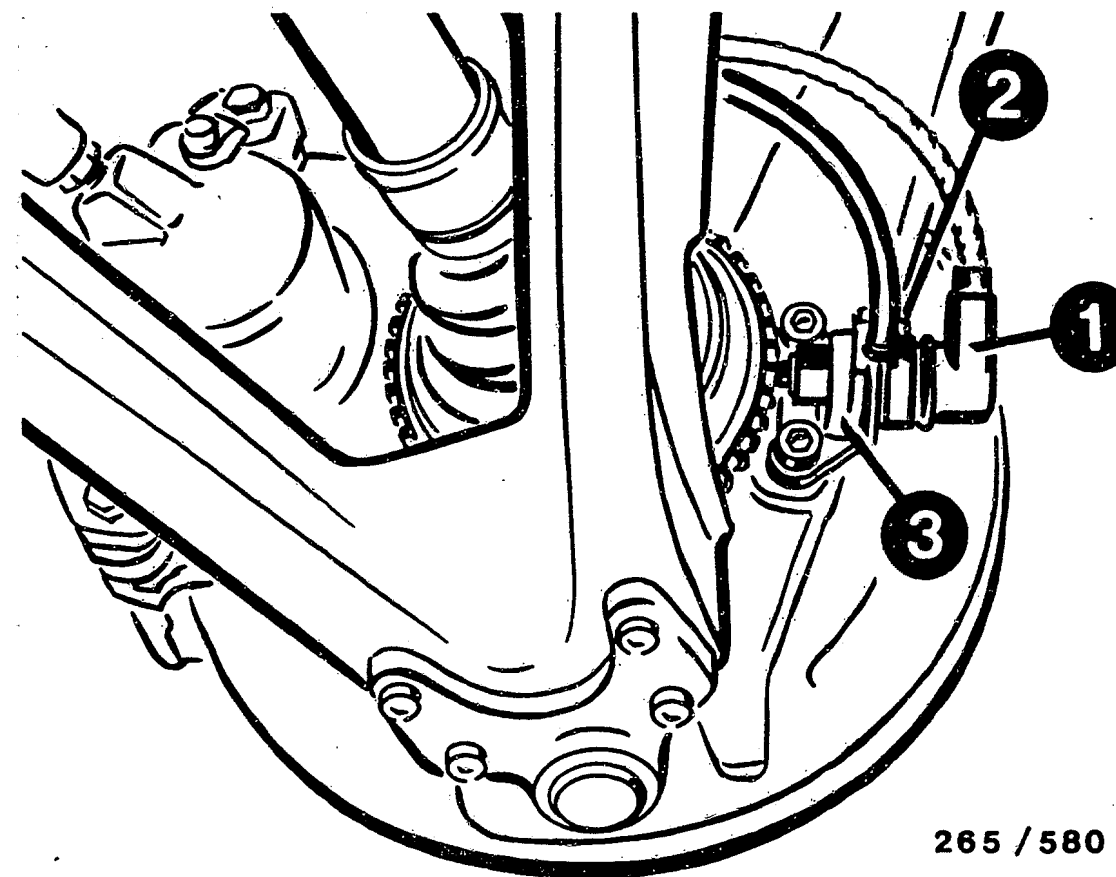


- 1 = ABS controller
- 2 = Over-voltage protection relay

INSTALLATION POSITION OF COMPONENTS

The installation locations always refer to the direction of travel.

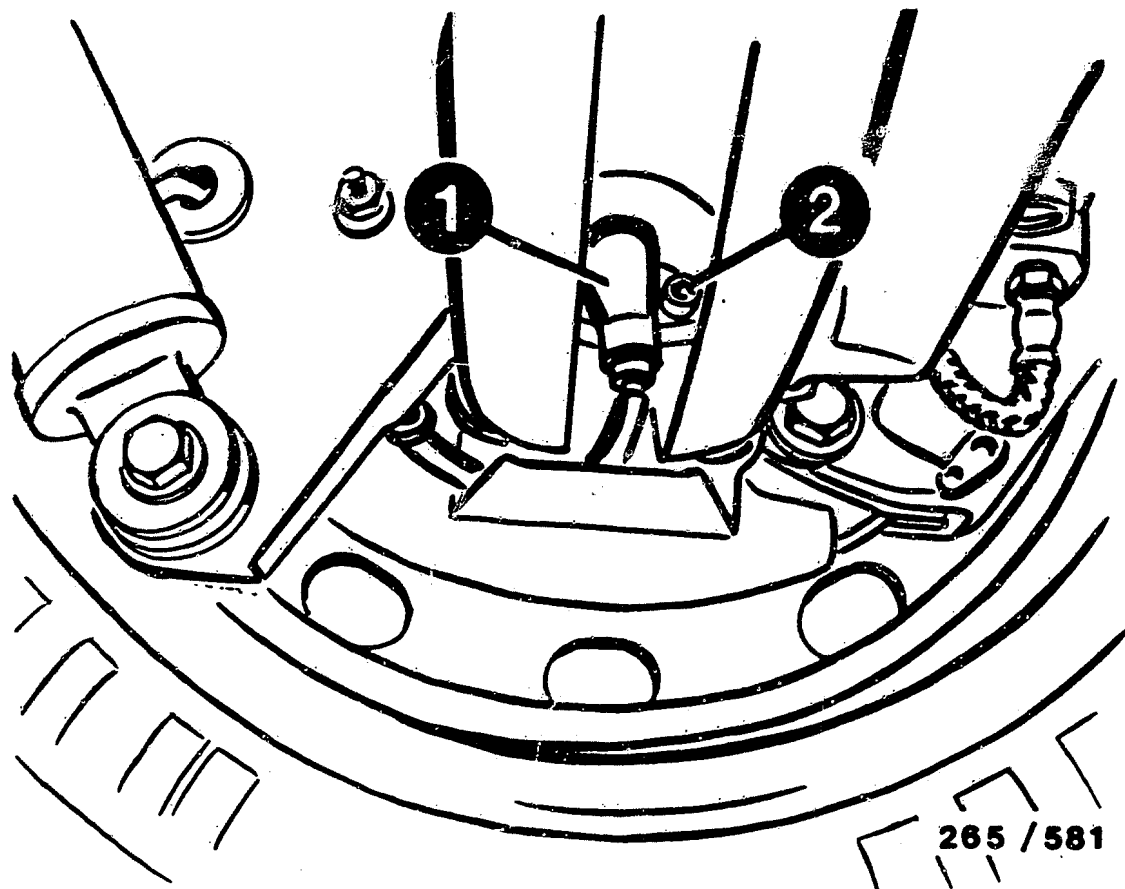
- * ABS controller:
In engine compartment on right beneath expansion tank.
Remove cover over controller.
- * Over-voltage protection relay:
In engine compartment, right at ABS-controller mount.
- * ABS warning lamp:
In instrument panel.
Symbol: Skidding car.



- 1 = Wheel-speed sensor, front
- 2 = Fastening screw
- 3 = Mount

INSTALLATION POSITION OF COMPONENTS (continued)

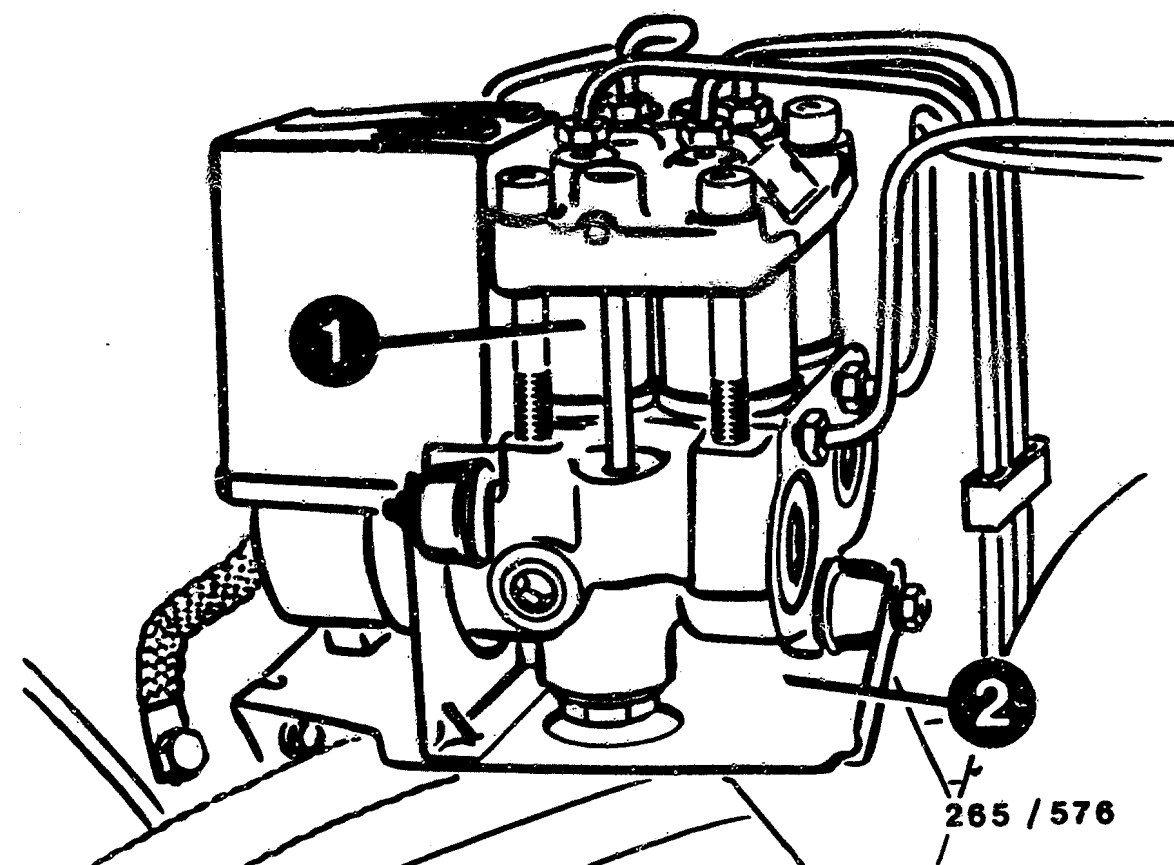
- * Wheel-speed sensor, front axle:
One each on left and right at steering-knuckle brackets.
Do not unscrew mount when removing!
Plug connections on left and right in wheel housings.
- * ABS ground terminal:
At ABS-controller mount.



- 1 = Wheel-speed sensor, rear
with front-wheel drive
2 = Fastening screw

INSTALLATION POSITION OF COMPONENTS (continued)

- * Wheel-speed sensor, rear axle:
One each on left and right at wheels.
Beneath wheel hub with front-wheel drive;
above wheel hub with 4-WD.
Do not unscrew mount when removing!
- Plug connections beneath vehicle on left
and right ahead of rear axle.
- * Pressure reducer:
Beneath vehicle on left behind differential



- 1 = Hydraulic modulator
2 = Mount

INSTALLATION POSITION OF COMPONENTS (continued)

- * Hydraulic modulator:
In engine compartment, right.

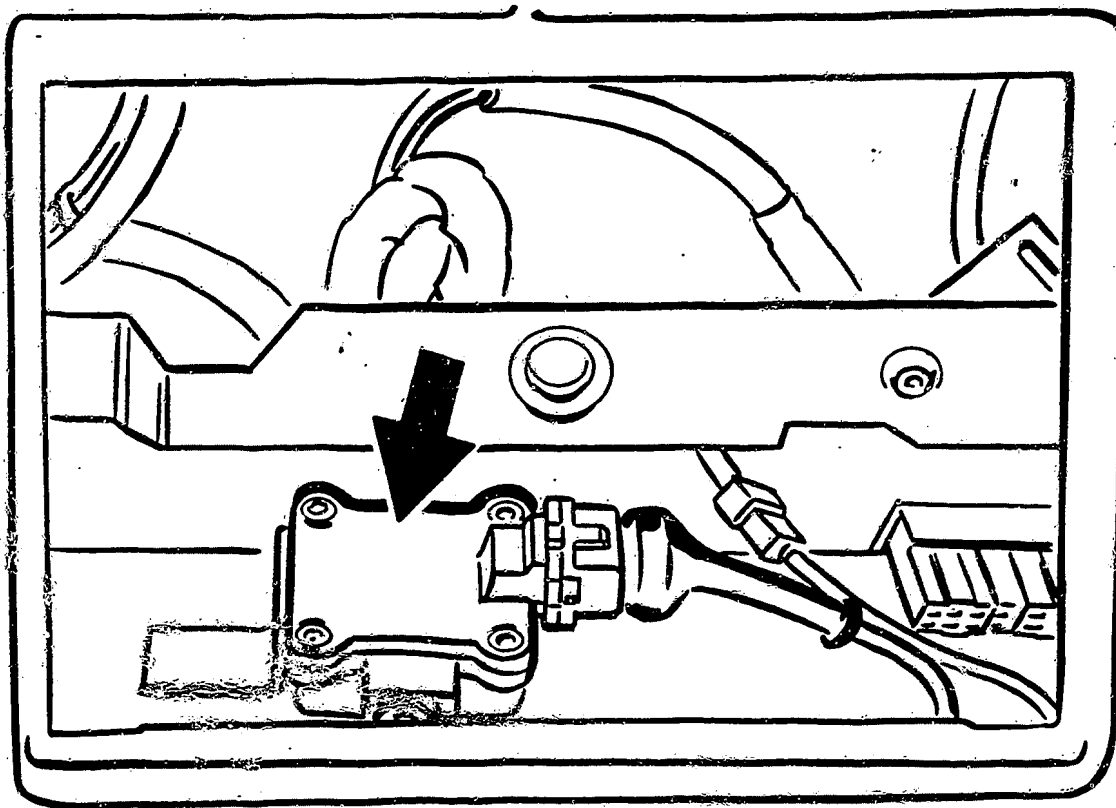
The hydraulic modulator is not to be repaired,
but rather only replaced as a complete unit.
Exception: relay change.

For assembly work and for changing relay,
loosen hydraulic modulator mount and lower
somewhat to front.

Do not mix up brake-line connections!
Pay attention to assignment.

Color code:

yellow = VL (front left),
green = VR (front right),
blau = HL (rear left),
red = HR (rear right).



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Arrow = Acceleration switch

INSTALLATION POSITION OF COMPONENTS (continued)

- * Acceleration switch:
On mount at center tunnel beneath radio.
Remove radio.
When installing:
Arrow on switch must point in direction
of travel. Attach without washers.

For production reasons:
continued on the following
coordinate.

Trouble-shooting instructions : VWW-5001

Bosch system : KE- JETRONIC

Vehicle make : VW

Basic microcard : KFZ-00..

Test instructions Coordinates

Special features.....02

Test specifications.....03

Rapid diagnosis chart.....08

Electrical terminal diagram.....19

Electrical safety circuit.....21

Air-/fuel-line diagram.....23

Installation position of components.....25

SPECIAL FEATURES

These instructions contain the KE 2.5-Jetronic trouble-shooting for the following vehicle models current at the time of writing:

* VW Golf GTI 16V (EU,US,J) (04.86 ->)

* VW Scirocco GTI 16V (EU,US,J) (04.86 ->)

1.8 l / 4-cylinder engine, 92kW/125 bhp

The KE-Jetronic of these models corresponds to the basic version, with the following additional functions and special features:

- Lambda closed-loop control
- Low-idle-speed control
- Overrun cut-off

- Fuel-injection valves with fixed air-guide cap. Connection of the fuel-distributor tester with adapter sleeves KDJE-P 200/19.

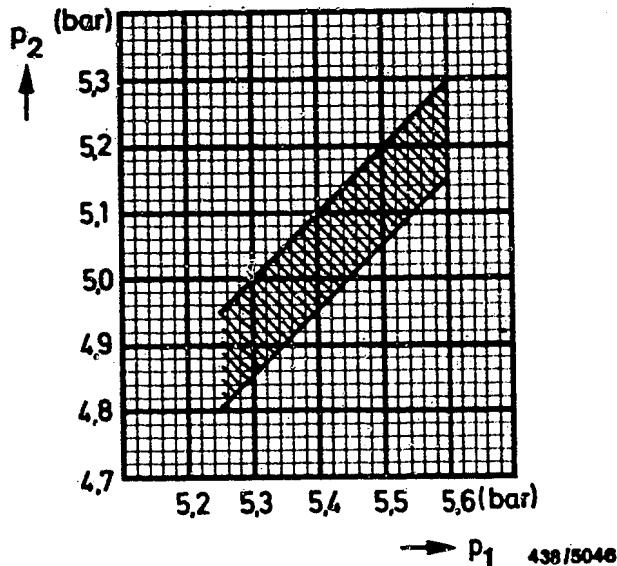
- In-tank pre-supply pump

Important information:

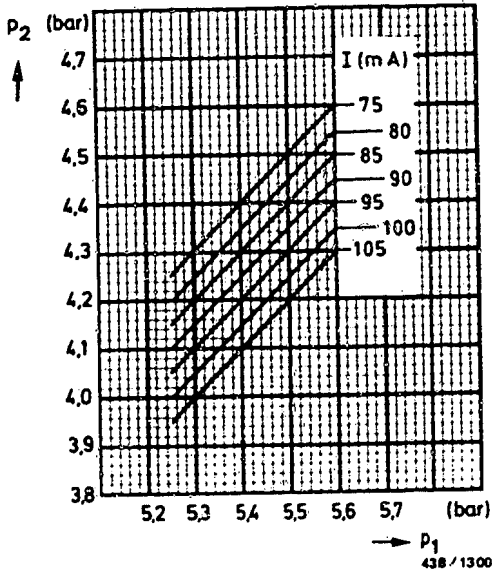
When referring to a basic microcard, note that the test specifications must always be taken from the vehicle-specific brief instructions.

TEST SPECIFICATIONS

No.	Test/Test condition	Test specification	
1	Electric fuel pump - delivery quantity:	min. 1100 cm ³ /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Get lower-chamber pressure "warm" nominal value from the upper diagram corresponding to the measured primary press. (actuator current 10mA). Get the lower-chamber "cold" nominal pressure from the lower diagram corresponding to the measured primary pressure and actuator current. Tolerance ± 0.15 bar. Simulation of the "cold" state: pull the cable plug on the engine temperature sensor.		
4	Sealing test - entire system: Minimum pressure after 10 min.: Minimum pressure after 20 min.:	2,7 bar 2,6 bar	
5	Fuel-injection valve opening pressure:	3,0...4,1 bar	
6	Delivery quantities - comparison measurement: (actuator current 10 mA) Idle: Part load: Full load: Minimum quantity at max. sensor-plate deflection	Setting point: (cm ³ /min)	Max. allow. quantity: (cm ³ /min)
		6,0 40,0 100,0	6,6 42,5 109,0
		110,0 cm ³ /min	



p_1 = Primary pressure
 p_2 = Lower-chamber pressure



TEST SPECIFICATIONS (CONTINUED)

No.	Test/Test condition	Test specifications	
7	Flow-through quantity, KE throttle:	130...150 cm ³ /min	
8	Engine temperature sensor (NTC): Engine cold (+15...+30°C): Engine warm (approx. +80°C):	1,3...3,6 k Ω 250...390 Ω	
9	Thermo-time switch - resistance measurement: Terminal G and ground: Terminal W and ground: Terminals G and W:	below +30°C 25... 40 Ω 0 Ω 25... 40 Ω	above +40°C 50... 80 Ω 100...160 Ω 50... 80 Ω
10	Idle-mix.-adj. screw - basic setting dimension: Fuel distributor support - needle bearing:	18,7...18,9 mm	
11	Air-flow sensor potentiometer: Voltage signal, sensor-plate basic setting:	0,01...0,05 V	
12	Idle adjustment*): Idle speed: (regulated by low-idle-speed control) On-off ratio to be set: (bypass screw) Exhaust-gas adj. via pressure-actuator current. Test specification: Setting value: CO concentration in exhaust gas (control value):	800...900 min ⁻¹ 28...30 % 4...16 mA 9...11 mA 0,3...1,2 vol. %	

TEST SPECIFICATIONS (CONTINUED)

*) Instructions for idle adjustment:

Exhaust-gas regulation is accomplished automatically by the lambda closed-loop control. The pressure-actuator triggering current in closed-loop operation (oscillating current reading) is tested. If the current reading is outside of the test specification, correct to the setting value by turning the idle-mixture-adjusting screw.

The CO control value is used to test whether there is any leakage in the exhaust system. Measure at the exhaust sampling pipe to the right of the intake manifold.

Switch off all electrical consuming devices as well as the air conditioner before idle testing. The radiator fan must not be running. Remove the PCV on the cylinder cover and leave open.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER
ETT 018.01 WITH KE2 ADAPTER CABLE 1 684 463 135 AND
SUITABLE MULTIMETER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic specialist to rapidly test the electrical/electronic peripheral and control-unit functions of the KE-Jetronic, including lambda closed-loop control.

Important information concerning the following rapid diagnosis chart:

The "test conditions" column specifies the test steps during which the control-unit plug must be connected or disconnected. Great care must be taken to ensure that the system is without current during all plugging and unplugging operations, i.e. the ignition must be switched off and the electrical safety circuit must not be bridged.

The "test connections" column indicates the leads in the current path for the measurement being made, with reference to the pin assignment of the control-unit plug. Any trouble-shooting that may be required will involve these leads.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/But. V	Ω	Bt n.	Test of	Test con- nections	Test conditions	Test specifications
1	V	4	-	Pressure actuator internal resistance (R ₁)	12 - 10	Disconnect control-unit plug.	20...30 Ω
2	V	5	-	Internal resistance of engine temperature sensor	21 - 2	Control-unit plug disconnected. Engine temperature +15...+30°C; approx. +80°C:	1.3...3.6 k Ω 250...390 Ω
3	V	11	-	Control-unit output stage ground	20 - 2	Control-unit plug disconnected.	0...10 Ω
4	V	9	-	Throttle-valve switch, idle	13 - 2	I m p o r t a n t : Voltage measurement; voltmeter connection: Negative = black socket "V" Positive = left blue socket " Ω " Control-unit plug disconnected. Switch on ignition. Throttle plate closed: Throttle plate open:	8...15 V 0 V
5	V	10	-	Throttle-valve switch, full load	5 - 2	I m p o r t a n t : Voltage measurement; voltmeter connection: Negative = black socket "V" Positive = left blue socket " Ω " Control-unit plug disconnected. Ignition switched on. Throttle plate closed: Throttle plate fully open:	0 V 8...15 V
6	3	—	-	Air-conditioner signal (a/c readiness)	16 - 2	Control-unit plug disconnected. Switch on ignition. Switch on air conditioner:	8...15 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/ V	But. Ω	Test of	Test con- nections	Test conditions	Test specifications	
7	4	—	—	Start signal, terminal 50	24 - 2	Control-unit plug disconnected. Operate starting motor:	8...15 V
8	5	—	—	Ignition TD signal	25 - 2	Control-unit plug disconnected. Operate starting motor for a few seconds:	Voltage undefined
9	6	—	—	Control unit - supply	1 - 2	Control-unit plug disconnected. Switch on ignition.	8...15 V
10	7	—	—	Supply, air-flow sensor potentiometer	18 - 2	Connect control unit. Switch on ignition.	7...8 V
11	8	—	—	Signal, air-flow sensor potentiometer	17 - 2	Control unit connected. Switch on ignition. Sensor plate at rest: Deflect sensor plate by hand, continuous voltage rise to max. :	approx. 0 V 8 V
12	10	—	—	Idle actuator Supply and continuity, winding 1	3 - 2	Switch off ignition. Disconnect control-unit plug. Switch on ignition.	8...15 V
13	11	—	—	Idle actuator, continuity, winding 2	4 - 2	Control-unit cable plug disconnected. Switch on ignition.	8...15 V
14	12	—	—	Air-conditioner compressor signal	19 - 2	Switch off ignition. Connect control unit. Start engine and switch on air conditioner. Compressor not running: Compressor running:	0 V 8...15 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

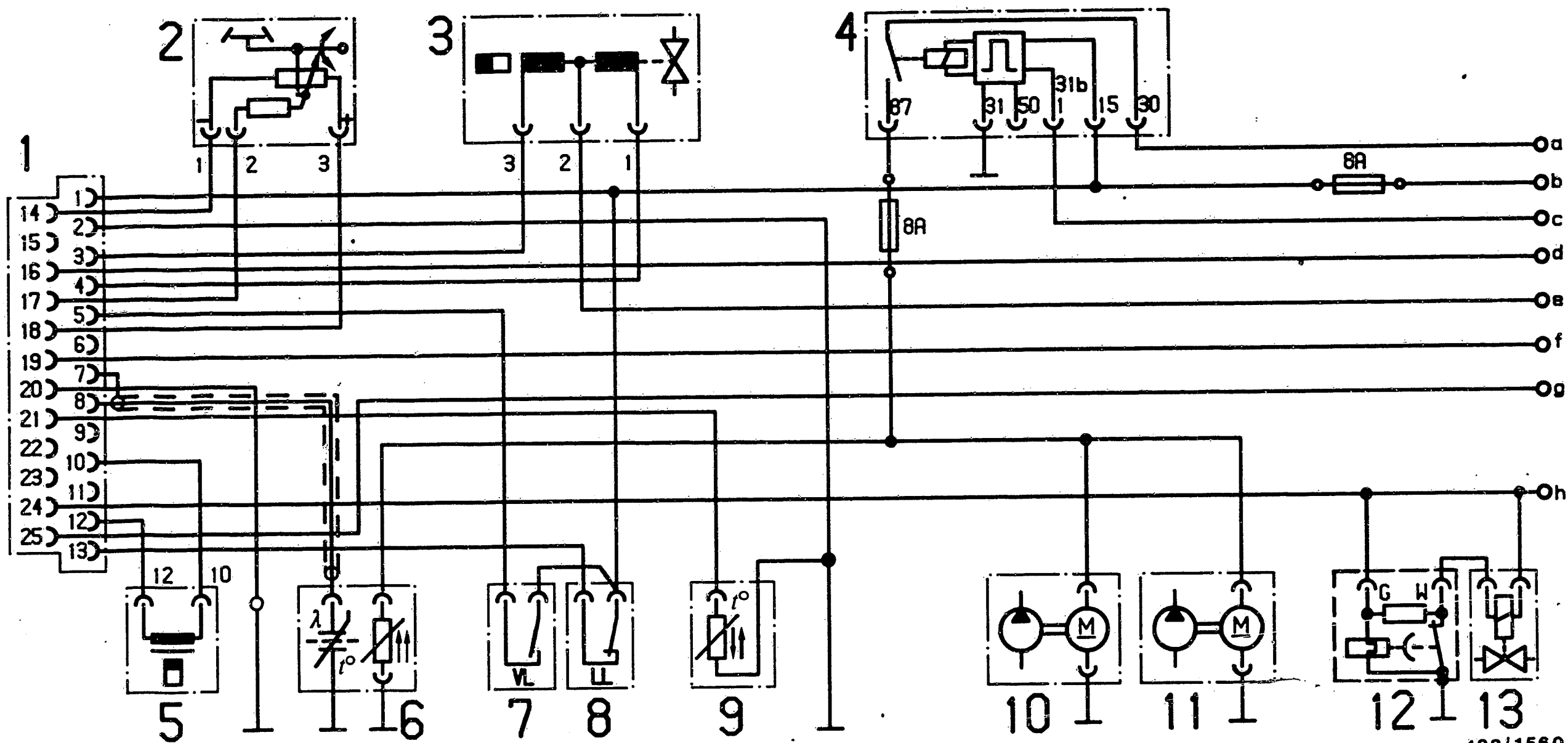
No.	Switch/ V	But. Ω	Bt n.	Test of	Test con- nections	Test conditions	Test specifications
15	14	24	-	Lambda closed-loop control, closed-loop operation	23 - 2	Connect control unit. Bridge sockets 1 and 2 on test adapter. Engine at normal operating temperature, idling. Closed-loop control operation: oscillating voltage reading. Mean value:	approx. 3 V
16	-	-	1	Warm-up enrichment -20°C	12 - 12	Current measurement! Tester connection: Negative = black socket 1 Positive = black socket 2 Control unit connected. Switch on ignition.	55... 75 mA
17	-	-	2	Actuator current Engine at operating temp.	12 - 12	Control unit connected. Switch on ignition.	9... 11 mA
18	-	-	1 /4	Post-start enrichment	12 - 12	Control unit connected. Switch on ignition. Keep button 1 pressed: Press button 4. Voltage rise to: After short delay, regulation to: Regulation time about 90 seconds.	55... 75 mA 120...150 mA 55... 75 mA
19	-	-	1 /6	Acceleration enrichment	12 - 12	Control unit connected. Switch on ignition. Keep buttons 1 and 6 pressed. Current: Quickly deflect sensor plate. Current rise to: Regulation in about 1 second to:	55... 75 mA 120...150 mA 55... 75 mA

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/ V	But. Ω	Test of Bt n.	Test con- nections	Test conditions	Test specifications
20	-	-	2	12 - 12	Control unit connected. Switch around positive and negative on ammeter. Start engine. Keep engine speed n at approx.: While button 2 is pressed, actuate throttle-valve switch idle. Engine "surges". Current reading during the falling engine- speed phase:	2500 min ⁻¹ -40...-80 mA
21	-	-	-	12 - 12	Control unit connected. Start engine and keep engine speed n at approx.: Actuate throttle-valve switch full load. Current increase by:	3000 min ⁻¹ 4... 8 mA
22	-	24	-	12 - 12	Control unit connected. Engine at normal operating temperature in idle. Closed-loop operation can be recognized by the oscillating current reading. Mean value: If mean value outside of tolerance, set (idle- mixture-adjusting screw) to:	4...16 mA 9...11 mA
23	-	22	-	12 - 12	Control unit connected. Switch on ignition. Current rise to:	18...22 mA
24	-	23	-	12 - 12	Control unit connected. Switch on ignition. Current drop to:	0... 2 mA

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/ V	But. Ω	Bt n.	Test of	Test con- nections	Test conditions	Test specifications
25	10	-	-	Low-idle-speed control		<p>Control unit connected. Test with lambda closed-loop control tester. Bridge black sockets 1 and 2 on test adapter.</p> <p>Engine idling at normal operating temperature. Idle speed (regulated): On-off ratio at idle speed: If necessary, adjust on-off ratio (bypass screw on throttle-valve assembly).</p> <p>Switch on air conditioner (compressor). Engine speed:</p>	<p>800... 900 min ⁻¹ 28... 30 %</p> <p>900...1000 min ⁻¹</p>

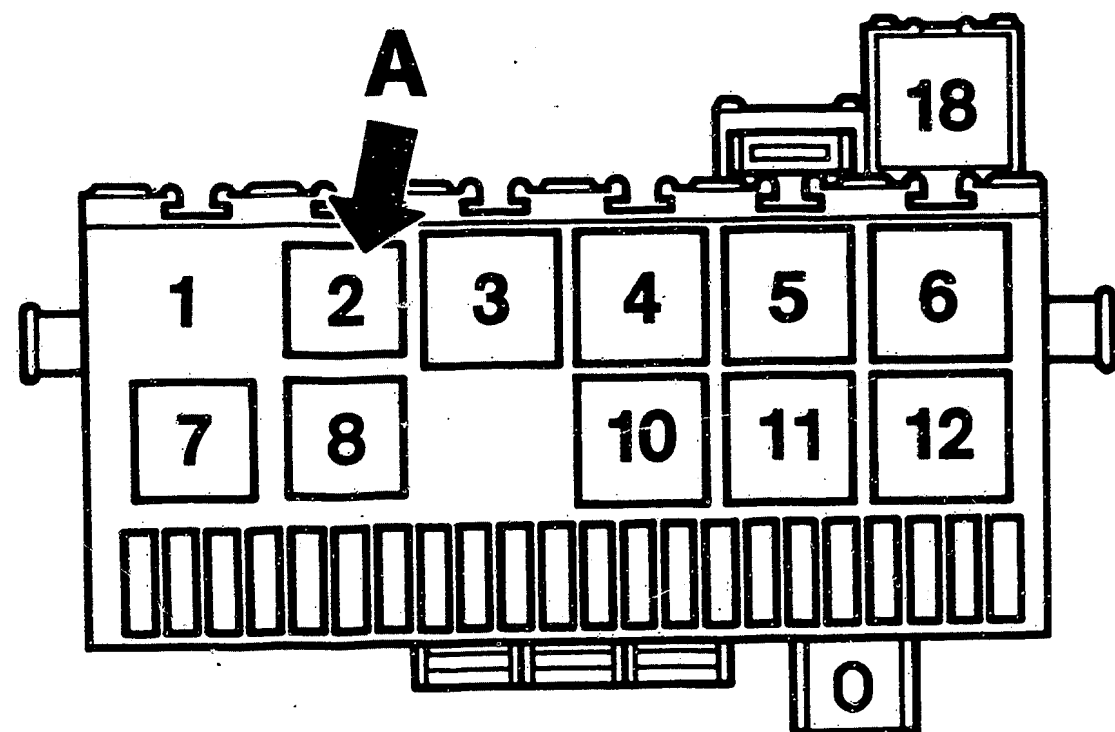


ELECTRICAL TERMINAL DIAGRAM WITH ELECTRIC FUEL PUMP SAFETY CIRCUIT

- 1 = KE-Jetronic control unit
- 2 = Air-flow sensor potentiometer
- 3 = Idle actuator
- 4 = Electronic engine-speed relay
- 5 = Electro-hydraulic pressure actuator
- 6 = Heated lambda sensor
- 7 = Throttle-valve switch, full load
- 8 = Throttle-valve switch, idle
- 9 = Temperature sensor, engine (NTC II)
- 10 = Pre-supply pump
- 11 = Electric fuel pump

- 12 = Thermo-time switch
- 13 = Start valve

- a = Terminal 30
- b = Terminal 15 (fuse 5)
- c = Control unit, ignition, terminal 10
- d = Air-conditioner connection (operating element)
- e = Ignition coil, terminal 15
- f = A/c compressor connection
- g = Control unit, ignition, terminal 2 (TD signal)
- h = Starting motor, term. 15a

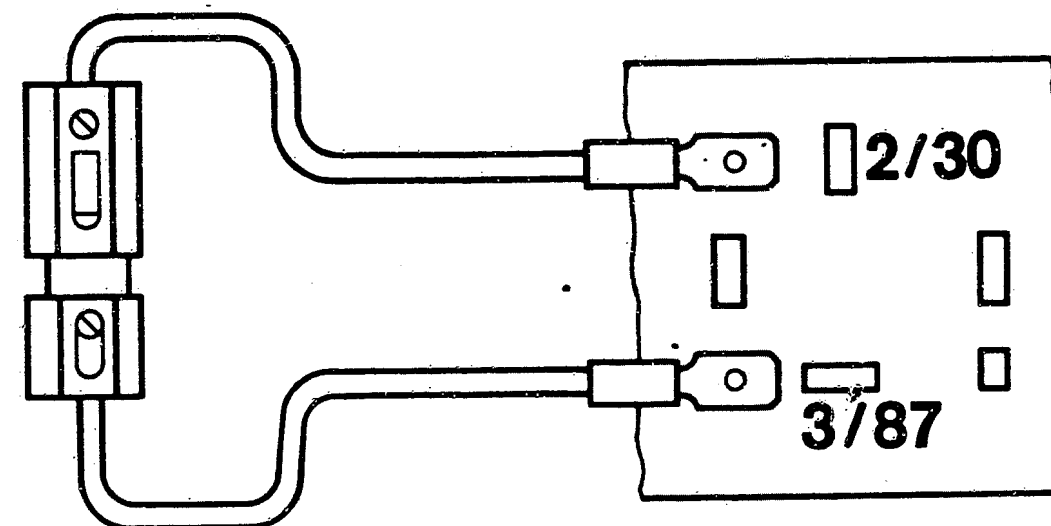


438 / 1491

A = Fuel-pump relay

BRIDGING THE SAFETY CIRCUIT

To do this, pull the fuel-pump relay, located in the central electrics console under the switchboard on the left, out of the relay plate.



438 / 1492

BRIDGING SAFETY CIRCUIT FOR ELECTRIC FUEL PUMP

For bridging purposes, remove relay from holder and detach it from relay frame.

Connect connections 30 and 87 with auxiliary lead (cross-section 1.5 mm² with fuse element)

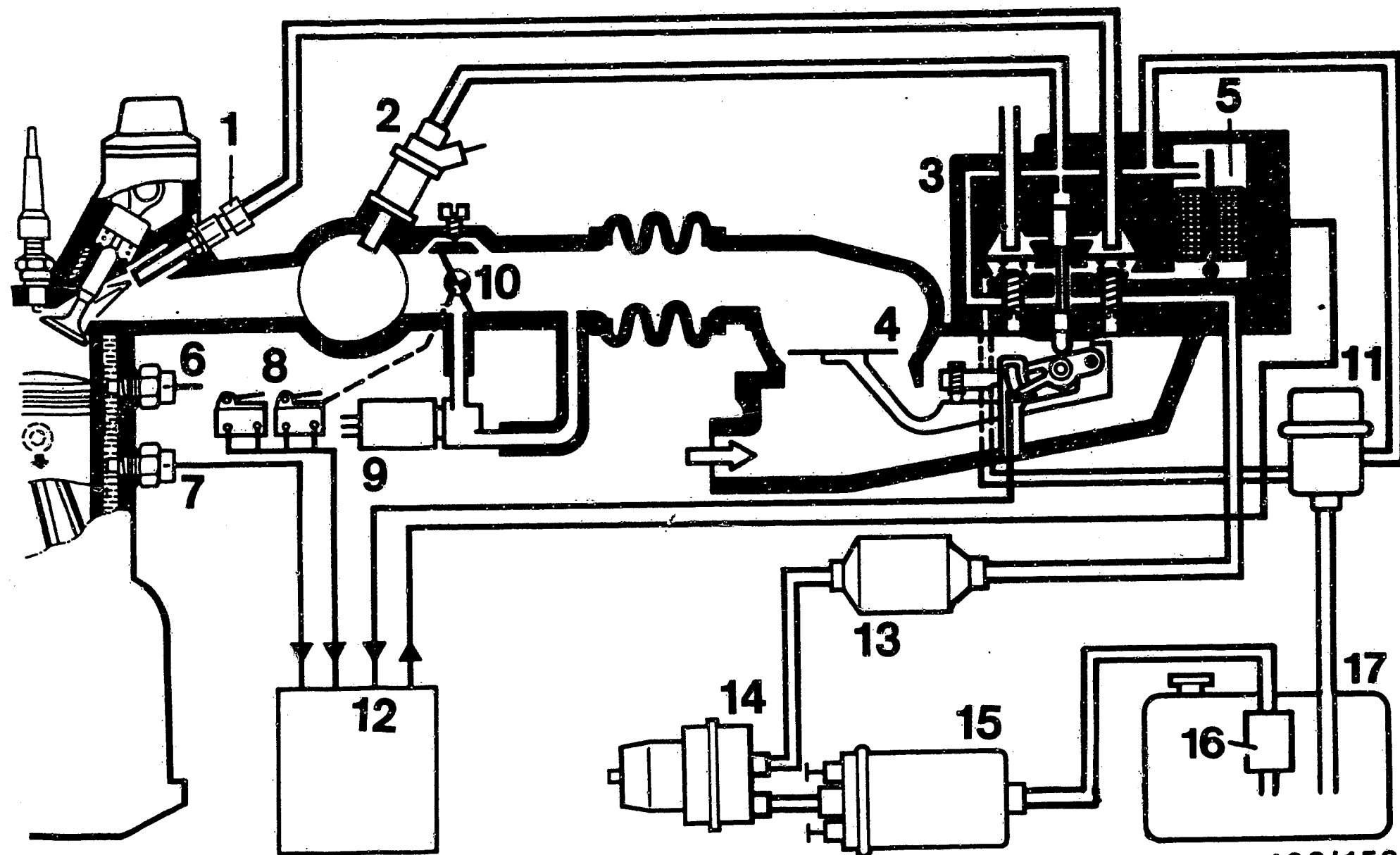
Important :

Function of electric fuel pump is required only for pressure measurements.

Only switch on ignition for electrical tests.

Caution :

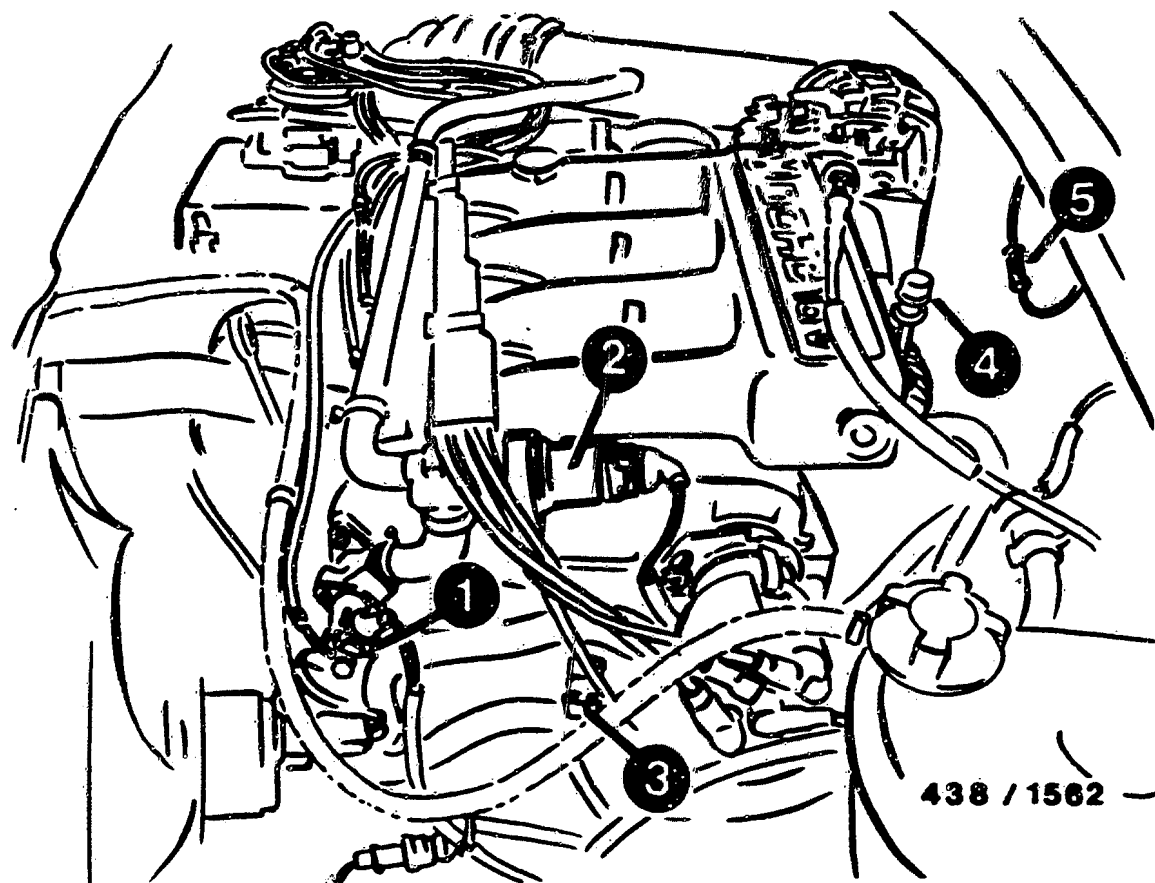
Never deflect (raise) air-flow sensor plate with electric fuel pump running, since otherwise fuel will be injected. Subsequently actuating the starting motor can lead to extremely severe engine damage.



AIR- AND FUEL-LINE DIAGRAM

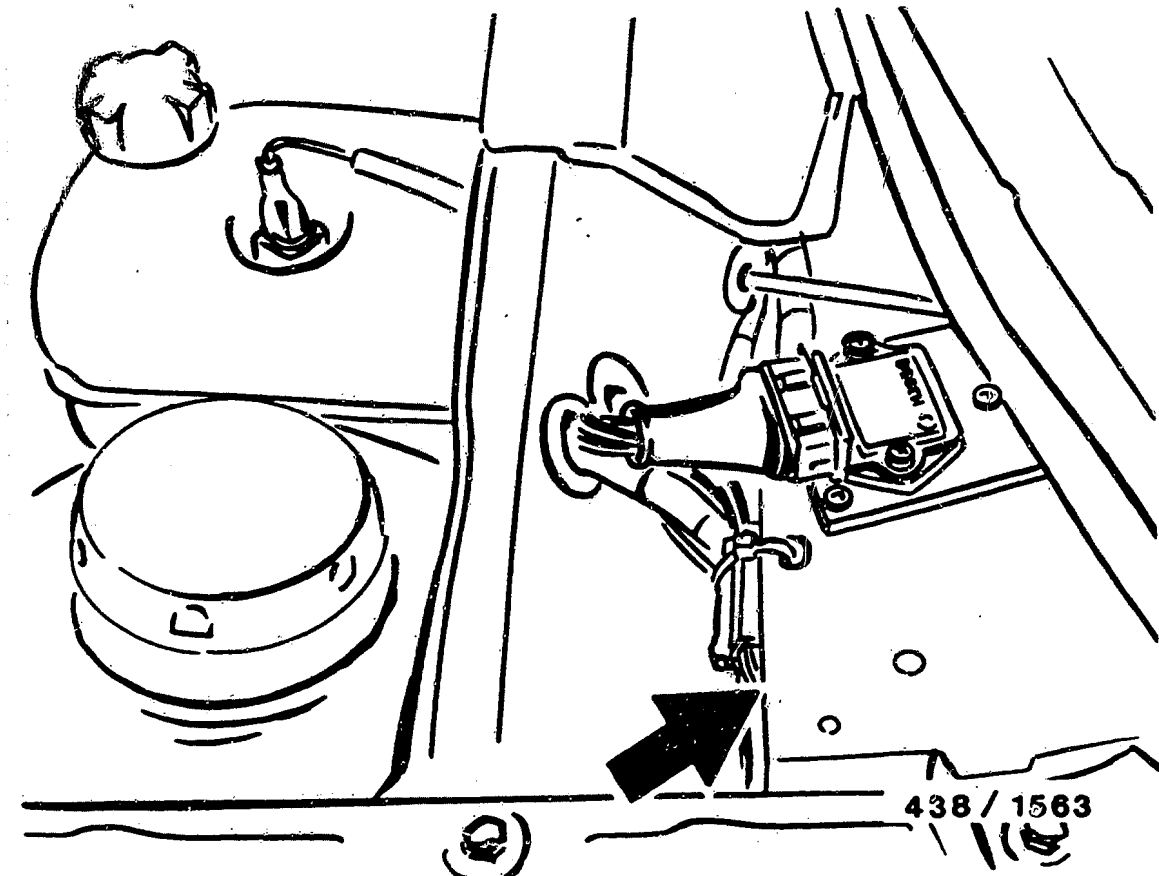
- 1 = Fuel-injection valve
- 2 = Start valve
- 3 = Fuel distributor
- 4 = Air-flow sensor
- 5 = Electro-hydraulic pressure actuator
- 6 = Thermo-time switch
- 7 = Temperature sensor (NTC)
- 8 = Throttle-valve switch I/FL
- 9 = Idle actuator

- 10 = Throttle valve
- 11 = Pressure regulator (primary pressure)
- 12 = KE-Jetronic control unit
- 13 = Fuel filter
- 14 = Fuel accumulator
- 15 = Electric fuel pump
- 16 = Pre-supply pump
- 17 = Fuel tank



- 1 = Start valve
- 2 = Idle actuator
- 3 = Thermo-time switch
- 4 = Exhaust-sampling pipe
- 5 = Lambda-sensor plug connection

INSTALLATION POSITION OF COMPONENTS



Arrow = KE-Jetronic control unit
(beneath a covering)

INSTALLATION POSITION OF COMPONENTS (CONT.)

- * Lambda-sensor:
In catalytic converter, on bottom of vehicle.
- * Electric fuel pump, fuel accumulator:
In the rear-axle area.
- * In-tank free-supply pump

BOSCH system : Mono-Jetronic
Make of vehicle : VOLKSWAGEN
Basic microcard : KFZ-00..

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Test specifications.....	17
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Installation position of components, removal and installation instructions.....	25

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle models with 1.781l/4 cyl. RP engine:

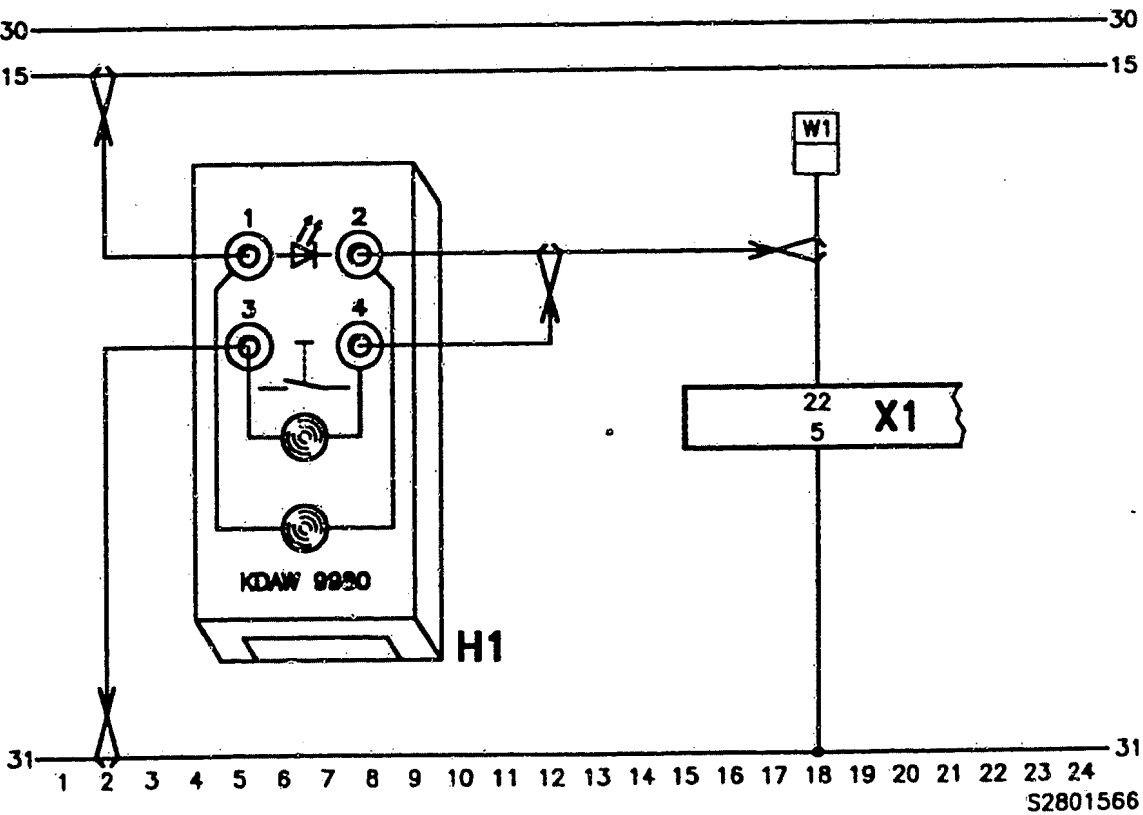
Volkswagen
Golf 1.8 Injection A,CH,D,USA (EU) 11.87->
Jetta 1.8 Injection A,CH,D,USA (EU) 11.87->
Passat 1.8 A,CH,D,S (EU) 4.88->

- * Mono-Jetronic with 25-pole control unit:
0 280 000 701/ 702 and 0 280 000 716/ 717 can only store one fault.
0 280 000 711/ 712, ...734/ 735, ...739/740 and ...741/ 742 can store several faults.
Speed triggering by means of TD rectangular signals from term.7 of ignition control unit.
- * Self-diagnosis with flashing-code output.
- * Load detection by means of throttle-valve potentiometer.
- * Adaptive Lambda closed-loop control with Lambda sensor.
In some cases sensor heating via relay.
- * Throttle-valve positioner with idle contact for idle-speed regulation.
- * Throttle-valve deflection with manual transmission via 4-bar linkage and closing damper.
- * Plausibility, i.e. a substitute value is provided by the control unit in the event of defective sensors.
This applies to the following sensors:
temperature sensor (engine), temperature sensor (intake air) and idle switch.
- * Pump relay for electric fuel pump.
In some cases in-tank pre-supply pump.
- * Use pressure gauge KDJE-P100/17 and hoses of pressure measuring device for fuel pressure testing.
Connect up 3-way line KDJE-P 100/13 or connection part KDJE-P 100/14 (M14x1.5) between fuel inlet line and throttle-body injection unit.
- * Intake manifold preheating by means of heating resistor, 65°C thermoswitch and relay.
- * Load-dependent flushing of active-carbon container by means of pulsed tank-ventilation timing valve and switching valve.

SPECIAL FEATURES (CONTINUED)

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

- * The assignment screw (at the bottom of the throttle-plate lever) is not to be used for adjusting the idle speed. It serves to set the position of the throttle valve with respect to the throttle-valve positioner. This is only necessary when renewing the throttle-valve section or the throttle-valve positioner.
- * Do not turn stop screw (minimum stop) of throttle valve as otherwise the control unit detects a fault. Screw is permanently set and secured against being turned.
- * Do not actuate idle contact with throttle valve deflector (part and full-load range). This could cause the throttle-valve positioner to block.
- * Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as this may alter the fuel pressure.
- * Do not adjust throttle-valve potentiometer. There is no service potential for checking assignment of throttle-valve position (angle) with respect to potentiometer.



H1 = Evaluation unit KDAW 9980
W1 = Diagnosis lead
X1 = Control-unit plug

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

A flashing-code display is required for readout of the fault memory. If there is no diagnosis lamp (LED) in the instrument panel, use is to be made of the evaluation unit KDAW 9980.

Connection	to	Terminal:
Socket:		
1 (+LED)		15 (ignition)
2 (-LED)		22 (control-unit diagnosis lead)
3 (button)		31 (ground)
4 (button)		Socket 2 (-LED)

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

Test prerequisite:

- * Voltage supply, positive and negative of control unit O.K.
Battery positive : to term.4,
Positive of term.15: to term.9,
Ground : to term.5 and term.25.
- * Diagnosis lamp (LED), if provided, in instrument panel O.K.
Positive of term.15: to diagnosis lamp, positive,
ground to diagnosis lamp: from term.22 of control unit.
- * Diagnosis lead (white/red, next to ignition coil).
Connected to term.22 of control unit.

Fault storage is effected in the case of:

- * Test drive lasting at least 10 minutes or
- * If engine won't run, actuate starting motor for approx. 6 seconds.
Do not switch off ignition.

Activation:

- * Switch on ignition or allow engine to idle.
- * Connect diagnosis lead (white/red next to ignition coil) to ground
for at least 4 s (or press button on KDAW 9980).
Diagnosis lamp starts to flash.

Readout of fault memory:

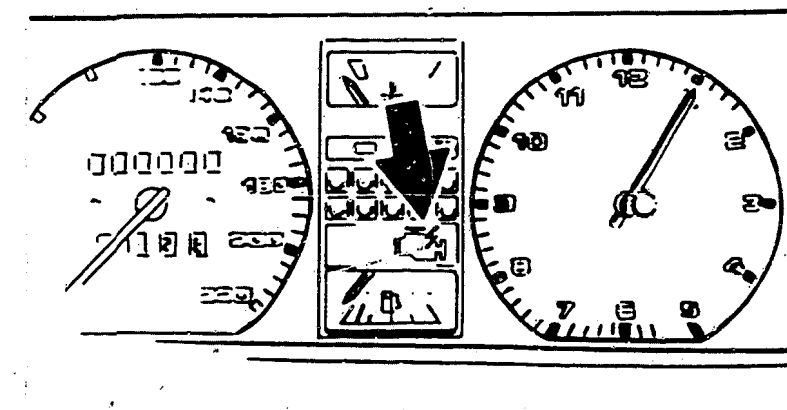
- * Each flashing code consists of 4 flashing-pulse groups with
a maximum of 4 flashing pulses. A flashing-pulse group can be
made up of 1, 2, 3 or 4 flashing pulses.
There are pauses of approx. 2.5 s between the flashing-pulse
groups.

Example: pulse sequence || ||| |||| ||
stands for flashing code 2 3 4 2

- * The flashing code is repeated until the ignition is switched
off or the engine speed is increased to in excess of 2500 min⁻¹.

Clearing of fault memory:

- * With ignition switched off, connect diagnosis lead to ground
(or press button on KDAW 9980).
- * Switch on ignition and detach ground connection after at
least 5 s (or release button).



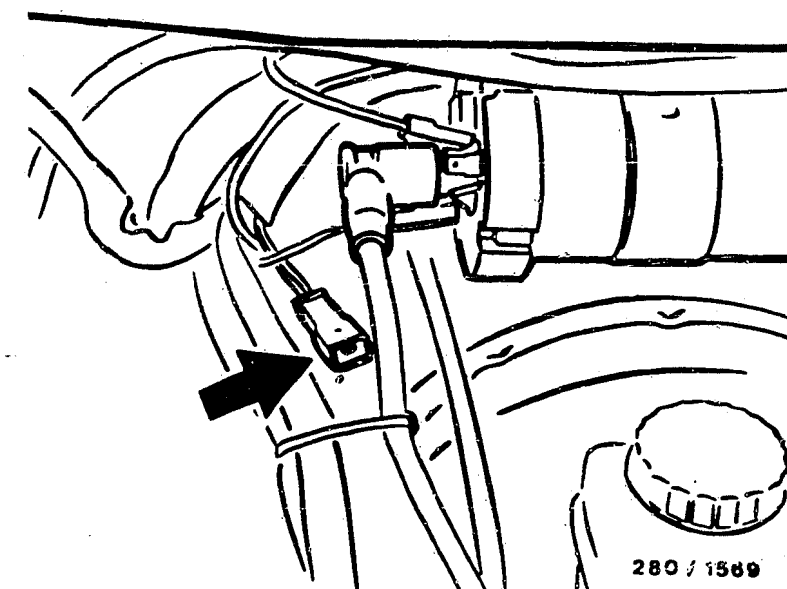
280 / 1568

Arrow = Diagnosis lamp (LED)
in instrument panel

Arrow = Diagnosis lead, Golf

The two 2-pole plugs are
located behind the selector
lever in the Passat.

Top left = Battery positive
Bottom left = Battery negative
Right = Diagnosis lead



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STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.

For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* Avoid injection of fuel when testing the compression.

To ensure this, disconnect pump relay.

For further precautionary measures, see brief instructions.

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*	*	*	*	*	*	*	*	*	*	Universal test adapter
*	*	*	*	*	*	*	*	*	*	Air-intake system
				*	*	*	*	*	*	Fuel delivery
*	*	*	*	*	*	*	*	*	*	Fuel pressure, leaks
		*	*	*	*	*	*	*	*	Solenoid-operated injection valve
			*	*	*	*	*	*	*	Alternator, interference-suppress.
*	*	*	*	*	*	*	*	*	*	Start control
			*	*	*	*	*	*	*	Overrun cutoff
		*	*	*	*	*	*	*	*	Engine-speed, CO setting
		*	*	*	*	*	*	*	*	Lambda closed-loop control
				*	*	*	*	*	*	Exhaust-gas catalyt. converter
		*	*	*	*	*	*	*	*	Tank ventilation

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values
1 1 1 1	Control unit	Replace control unit without further testing.	—	—
2 1 2 1	Idle contact	Assignment screw of throttle-plate lever must close idle contact. Check resistance directly at throttle-valve positioner. Throttle valve closed: Throttle valve open: Check following leads: from control-unit plug to throttle-valve-positioner idle contact and to ignition-timing valve, from idle contact to engine ground.	3 - 4 3 - 3 4-grd	0...0.5 Ω infinity Ω approx. 0 Ω approx. 0 Ω
2 1 2 2	No engine-speed signal	Check lead from control unit term. 1 to ignition trigger box term. 7. Check TD-rectangular signal with engine tester at control-unit plug term. 1. Check ignition system.	1 - 7 1 - 5	approx. 0 Ω Square-wave voltage min. 80 % U-battery
2 2 1 2	Throttle-valve potentiometer	Measure resistance value directly at throttle-valve potentiometer: Deflect throttle valve: Check leads from control unit to throttle-valve potentiometer: Lead from potentiometer to engine ground Short-circuit to + 5 V.	1 - 5 2 - 4 8 - 5 7 - 2 18 - 4 1-grd	600...1400 Ω 400...4000 Ω Maximum at part load approx. 0 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω
2 3 1 2	Temperature sensor (Engine)	Measure resistance value directly at temperature sensor: at ambient temperature +15...+30°C: with engine at operating temp. approx. +80°C: Check leads from control unit to temp. sensor (NTC).	2 -NTC NTC-grd grd-5	1.45...3.3 k Ω 280...360 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values
2 3 2 2	Temperature sensor (intake air)	Measure resistance value directly at quadruple plug: at ambient temperature +15...+30°C: at approx.+50°C: Check following leads: from control unit term. 14 to temp. sensor term. 1 from engine ground to temp. sensor term. 4	1 - 4 14 - 1 grd-4	1.45...3.3 k Ω 700 ...950 Ω approx. 0 Ω approx. 0 Ω
2 3 4 1	Lambda closed-loop control not within working range (control limits exceeded or undershot).	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Check sensor heater	20	Resistance value: Supply voltage : 1...15 Ω 8...15 V
2 3 4 3	Lambda closed-loop control has reached adaption limits.	Sensor ceramics clogged. Intake system leaking. Tank-ventilation valve permanently open. Injection valve defective, check Check fuel pressure		Resistance value: Set value: 1.0...1.6 Ω see test specifications on diagram
2 3 4 2	Lambda sensor	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Sensor ceramics clogged. Check sensor heater	20	Resistance value: Supply voltage : 1...15 Ω 8...15 V
4 4 3 1	Throttle-valve positioner	Measure resistance directly at quadruple plug : Check following leads: from control-unit plug term. 24 to positioner term.1 from control-unit plug term. 23 to positioner term.2 Control unit defective.	1 - 2 24 - 1 23 - 2	4...250 Ω approx. 0 Ω approx. 0 Ω
4 4 4 4	No fault stored	Continue trouble-shooting in accordance with trouble-shooting chart		
0 0 0 0	End of fault output	If necessary, continue trouble-shooting in accordance with trouble-shooting chart		

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01

Adapter lead: 1 684 463 170

Test step	Switch	V	Ω	Terminals	Testing of component/function	Test instructions/ test conditions	Set values
1	5	—	—	1 — 5 (+) (—)	TD speed signal from ignition trigger box term.7	Transmission in neutral, start engine	Square-wave voltage min. 80% U-batt.
2	6	—	—	4 — 5 (+) (—)	Voltage supply of control unit		8...15 V
3	7	—	—	9 — 5 (+) (—)	Voltage supply via ignition term.15	Switch on ignition	8...15 V
4	8	—	—	17 — 5 (+) (—)	Simulated actuation Electric fuel pump	Switch on ignition Press button 3	Electric fuel pump runs, check by listening
5	8	—	—	17 — 5 (+) (—)	Pump relay	Switch on ignition	8...15 V
6	—	—	—	—	Not applicable		
7	—	—	—	—	Not applicable		
8	12	—	—	12 — 5 (+) (—)	Tank-ventilation timing valve	Switch on ignition Press button 4	Timing valve must be energized, check by listening
9	13	—	—	3 — 5 (+) (—)	Ignition-timing valve	Switch on ignition Depress accelerator pedal somewhat	8...15 V
10	 V	5	—	22 — 5	Diagnosis lamp (LED) (if provided)	Press button 1	Diagnosis lamp lights up
11	 V	7	—	3 — 5	Throttle-valve positioner Idle contact	Detach plug of ignition-timing valve. Accelerator pedal in off-position: Depress accelerator pedal somewhat: Attach plug to ignition-timing valve.	0...10 Ω infinity Ω

G13

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G14

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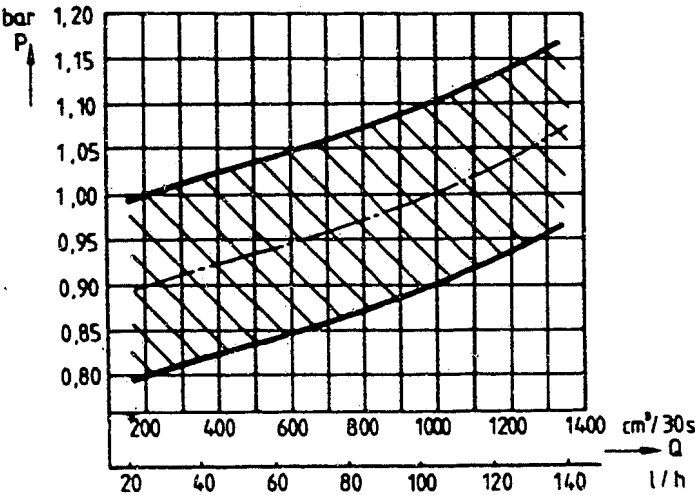
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)

Adapter lead : 1 684 463 170

Test step	Switch	Terminals	Testing of component/function	Test instructions/Test conditions	Set values	
V	Ω					
12	 V	8	6 - 5	Ground connection (transmission switch)	Ignition "OFF", manual transmission arbitrary, automatic P/N : automatic Drive:	0...10 Ω infinity Ω
13	-	-	-	not applicable		
14	 V	10	11 - 5	Pump-encoding connection		0...10 Ω
15	 V	11	14 - 5	Temperature sensor (intake air)	Ambient temperature +15...30 °C ; at approx.+50°C:	1.45...3.3 k Ω 700 ...950 Ω
16	 V	12	2 - 5	Temperature sensor (engine)	Ambient temperature +15...30 °C ; Engine at operating temperature approx. +80 °C :	1.45...3.3 k Ω 280...360 Ω
17	 V	13	25 - 5	Ground connection Output stage		0...10 Ω
18	 V	14	13 - 5	Solenoid-operated injection valve and series resistor		6...12 Ω
19	 V	15	8 - 5	Throttle-valve potentiometer		600...1400 Ω
20	 V	16	7 - 18	Throttle-valve potentiometer	Deflect throttle valve (Maximum value at part load)	400...4000 Ω
21	 V	20	23 - 24	Throttle-valve positioner		4...250 Ω

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Delivery at return:	min. 650 cm ³ /30s
* Supply voltage under load:	min. 12 V
* Pre-supply of in-tank pump:	min. 750 cm ³ /30s
Pressure regulator	
* Fuel pressure with engine stopped:	see diagram
Solenoid-operated injection valve	
* Internal resistance between term.2 and term.3 at ambient temperature +15...+30 °C :	1,0...1,6 Ω
* Leakage after 60 s:	a maximum of 1 droplet may drip off
Series resistor	
* Internal resistance:	2,5...4,0 Ω
Throttle-valve potentiometer	
* Internal resistance between term.5 and term.1 :	600...1400 Ω
term.4 and term.2 :	400...4000 Ω
Deflect throttle valve (Maximum value at part load)	
Throttle-valve positioner	
* Internal resistance between term.1 and term.2 :	4...250 Ω
* Idle contact term.3 and term.4:	0...0,5 Ω
Lambda sensor heater	
* Internal resistance (PTC) with engine stopped:	1...15 Ω



280/1411

Q = Fuel delivery of electric fuel pump
p = Primary pressure

TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Temperature sensor (engine)

- | | |
|---|----------------|
| * Internal resistance at ambient temperature +15...+30 °C : | 1,45...3,3 k Ω |
| with engine at operating temp. approx. +80 °C : | 280...360 Ω |

Temperature sensor (intake air)

- | | |
|---|----------------|
| * Internal resistance between term. 1 and term. 4 at ambient temperature +15...+30 °C : | 1,45...3,3 k Ω |
| at approx. +50 °C : | 700...950 Ω |

Tank-ventilation frequency valve and tank-ventilation switching valve

- | | |
|---|------------|
| * Internal resistance at ambient temperature +15...+30 °C : | 35... 55 Ω |
|---|------------|

Start control

- | | |
|---|--------------------|
| * Voltage at injection valve Start initiation : | greater than 1,0 V |
| after approx. 15s: | approx. 0,3 V |

Idle

Engine at operating temperature, approx. +80°C

- | | |
|-------------------------|-----------------------------|
| * Idle speed: | 750...950 min ⁻¹ |
| * Lambda sensor voltage | |
| Emissions "lean": | 0,05...0,3 V |
| Emissions "rich": | 0,60...1,0 V |

Idle speed and lambda closed-loop control cannot be adjusted (adaptive control)

TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Closing damper

(manual transmission only)

- | | |
|--|--------------|
| * Press-in travel of plunger, moved by throttle-plate lever: | 4,0...4,5 mm |
|--|--------------|

Intake-manifold preheater (hedgehog)

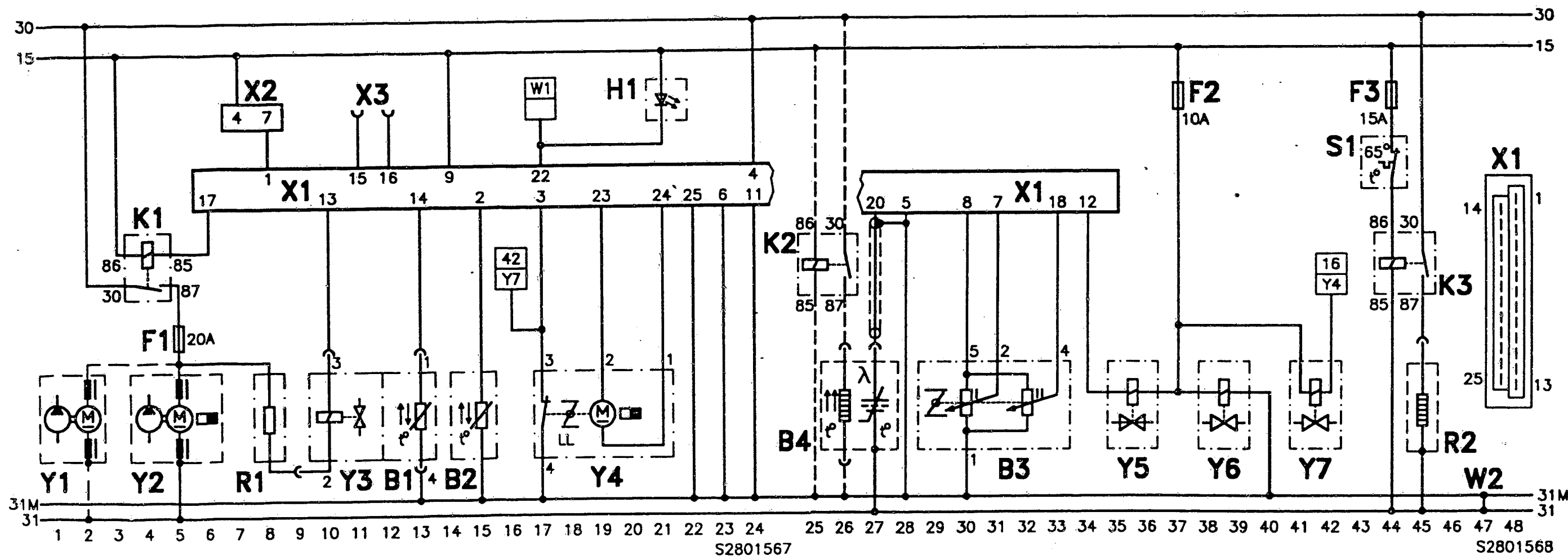
- | | |
|---|--------------|
| * Internal resistance between plug and ground with engine cold: | 0,25...0,5 Ω |
|---|--------------|

Thermoswitch (red)

for intake-manifold preheater

- | | |
|---------------------------------------|-------------|
| * Internal resistance less than 55°C: | approx. 0 Ω |
| above 65°C: | infinity Ω |

Refer to equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data

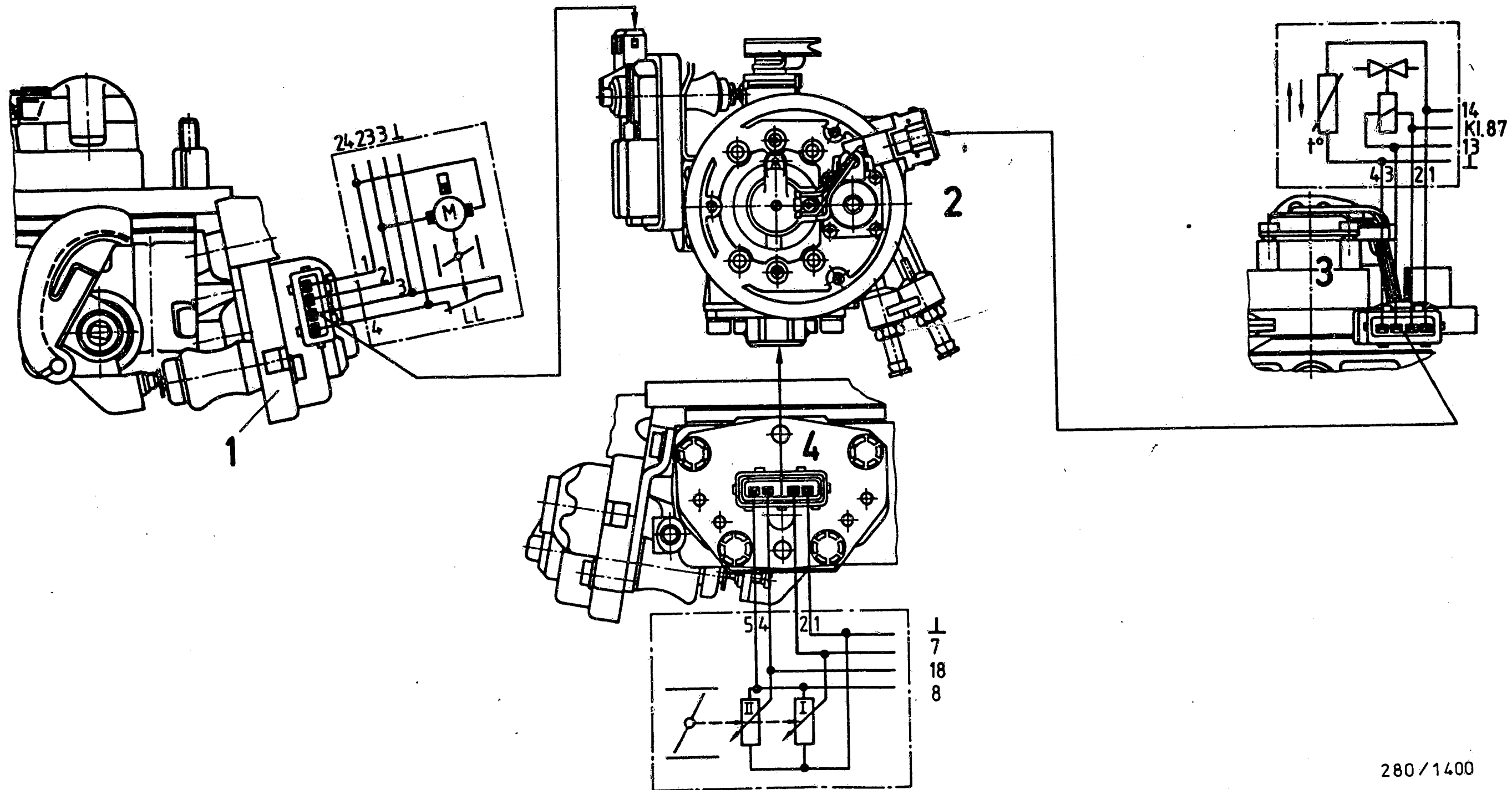


ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (intake air)
B2 = Temperature sensor (engine)
B3 = Throttle-valve potentiometer
B4 = Lambda sensor (heated in some cases)
F1 = Fuse (fuel pump)
F2 = Fuse
F3 = Fuse (intake-manifold preheating)
H1 = Diagnosis lamp (LED)
K1 = Pump relay

K2 = Relay, sensor heater
K3 = Relay, intake-manifold preheater
R1 = Series resistor
R2 = Intake-manifold preheater
S1 = Thermoswitch
W1 = Diagnosis lead
W2 = Ground strap, engine
X1 = Control-unit plug, Monojetr.
X2 = Control-unit plug, ignition
X3 = Plug for A/C

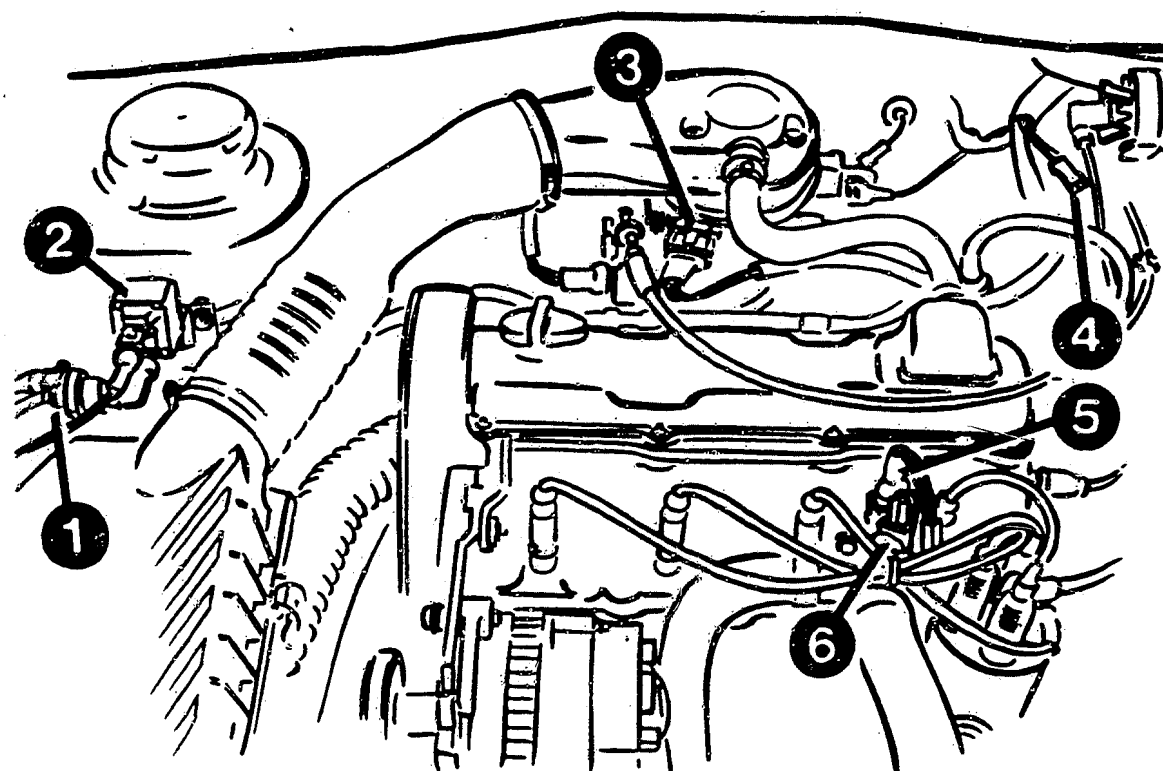
Y1 = Pre-supply pump
Y2 = Electric fuel pump
Y3 = Solenoid-operated injection valve
Y4 = Throttle-valve positioner
Y5 = Tank-ventilation timing valve
Y6 = Tank-ventilation switching valve
Y7 = Ignition-timing valve



PLUG ASSIGNMENT OF THROTTLE-BODY INJECTION UNIT

- 1 = Throttle-valve positioner with idle contact
- 2 = Throttle-body injection unit

- 3 = Solenoid-operated injection valve and temperature sensor (intake air)
- 4 = Throttle-valve potentiometer



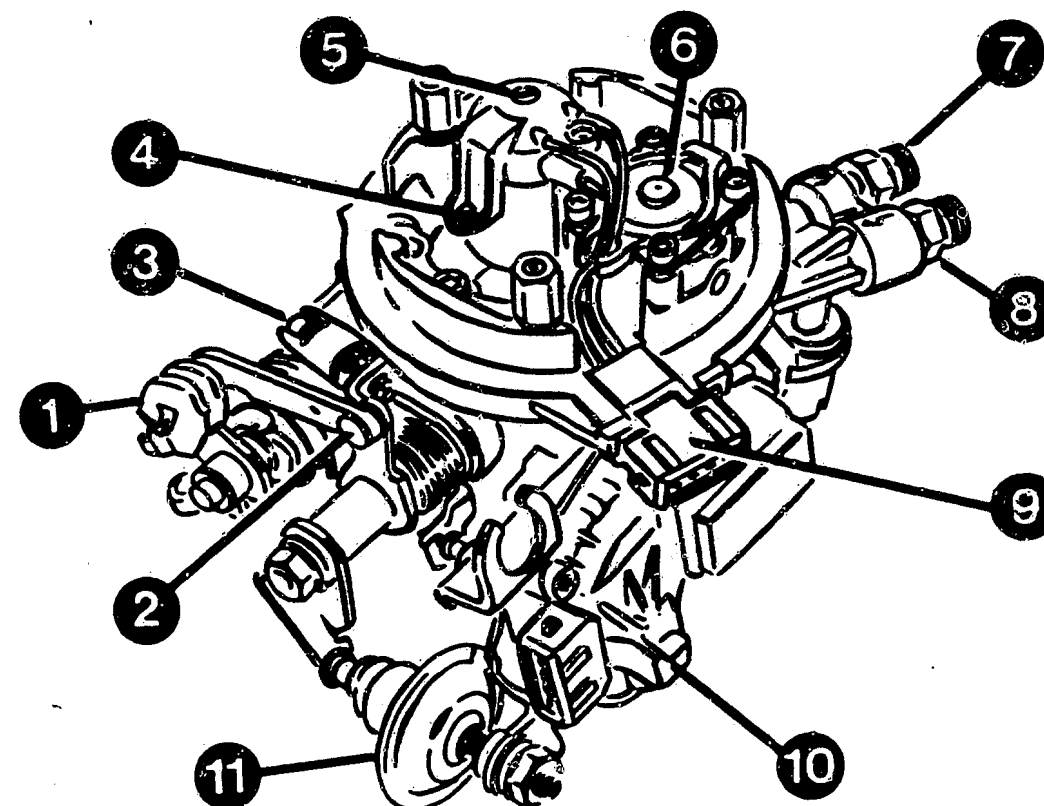
280 / 1573

- 1 = Tank-ventilation frequency valve
- 2 = Tank-ventilation switching valve
- 3 = Throttle-body injection unit
- 4 = Diagnosis plug
- 5 = Temperature sensor (engine)
- 6 = Thermostwitch for intake manifold preheater

INSTALLATION POSITION OF COMPONENTS

All installation locations refer to the direction of travel.

Arrangement of components in engine compartment.



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- 1 = Pulley
- 2 = Four-bar linkage for throttle-plate lever
- 3 = Secured stop screw (minimum stop)
- 4 = Temperature sensor (intake air)
- 5 = Solenoid-operated injection valve
- 6 = Pressure regulator
- 7 = Fuel return
- 8 = Fuel inlet
- 9 = Quadruple plug for injection valve and temperature sensor (intake air)
- 10 = Throttle-valve positioner
- 11 = Closing damper

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The in-tank electric fuel pump is in the fuel tank or pump accumulator.
If provided, a pre-supply pump in the fuel tank is combined with the fuel gauge.

The Lambda sensor is screwed in in the exhaust pipe ahead of the catalytic converter.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Top picture

1 = Tank-ventilation timing valve

2 = Tank-ventilation switching valve

Both valves are attached to the right-hand spring-strut dome.

* Center picture

1 = Plug for injection valve and temperature sensor (intake air)

2 = Air scoop for air guidance

3 = Plug connection for throttle-valve potentiometer

4 = Ignition-timing valve

5 = Exhaust-gas sampling point

6 = Diagnosis plug

7 = Plug connection of Lambda sensor lead

8 = Ground connection

* Bottom picture

1 = TIH ignition trigger box

2 = Series resistor for injection valve

3 = Control unit for Monojetronic.

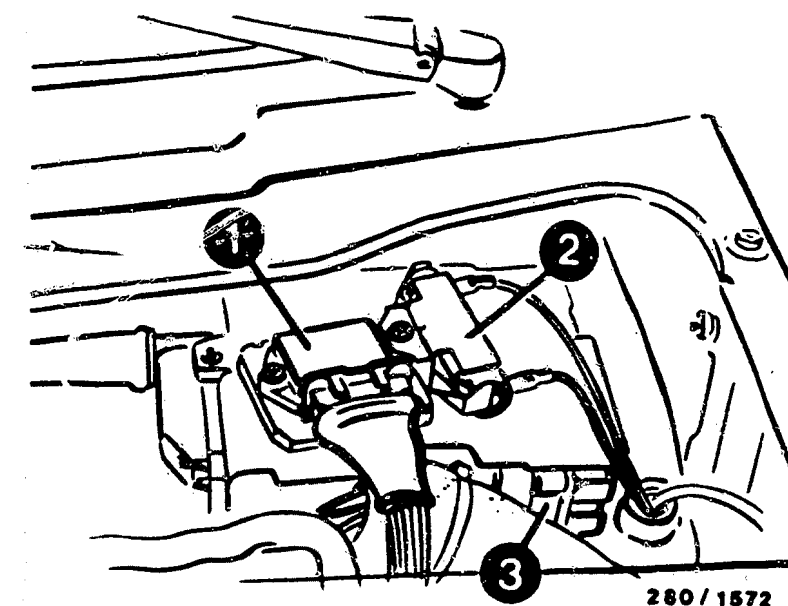
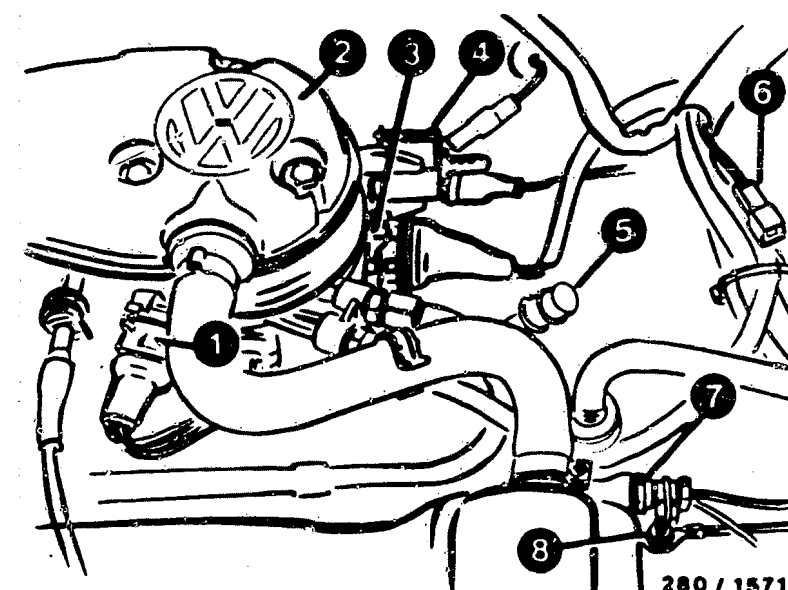
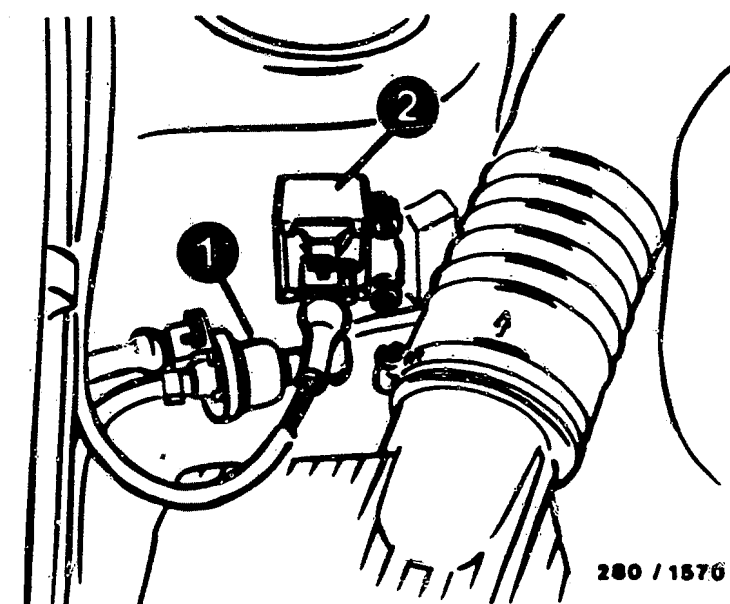
Other installation positions

* The pump relay of the safety circuit is located at relay position 12 of the relay plate beneath the instrument panel.

* The relay of the sensor heater (only for heated Lambda sensor) is located at relay position 3.

* The relay for the intake-manifold preheater is located at relay position 13.

* The diagnosis lamp (LED) is located in the instrument panel.



Trouble-shooting instructions : JAG-5002

BOSCH system : ABS

Make of vehicle : JAGUAR

Basic microcard : KFZ-00..

TABLE OF CONTENTS

Section	Coordinates
Special features	02
Structure, usage	03
Safety and precautionary measures	03
Test requirements	05
Rapid diagnosis chart	07
Test specifications	19
Electrical terminal diagram	21
Installation position of components, notes on removal and installation	23

SPECIAL FEATURES

This microcard contains the trouble-shooting instructions, valid at the time of publication, for the following models:

Jaguar XJ 6 3.6, Daimler 3.6, Sovereign 3.6
Jaguar XJS 3.6 Coupe, Convertible

- * ABS with 4 wheel-speed sensors and 3 hydraulic channels.
- * Brake-circuit arrangement on axle basis.
- * Sensor ring gears with 48 teeth.
- * Wheel-speed-sensor test:

The non-disconnectable differential lock means that the wheels at the rear axle cannot be turned by hand or only with great difficulty.

Caution:
Do not drive rear axle with brake dynamometer for wheel-speed-sensor testing.

Jack up vehicle, move selector lever to N and let engine run. Both wheels of rear axle turn.
Set switch for wheel selection on ABS2 LED-tester to wheel to be tested.
After testing the wheel-speed sensors, they must be checked for possible mix-ups whilst the vehicle is still jacked up.

Mix-up test:
Consecutively move wheels at rear axle back and forth by hand as far as they will go and observe indication on tester. LED flickers or pointer deflects slightly.

STRUCTURE, USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

For a detailed description of trouble-shooting, see the basic instructions.

ATTENTION :

The set values, terminal assignments and special features of these vehicle-specific brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

*For reasons of safety, the hydraulic modulator must not be repaired, but may be exchanged only as a complete unit.

Exception: relays

*Do not loosen any screws on the hydraulic modulator! Danger of fatal accident owing to failure of the brakes.

*Take great care when handling brake fluid.

Poison!

For further information, see brief instructions.

For production reasons:
continued on the following
coordinate.

TEST REQUIREMENTS FOR TESTING WITH ABS2 LED TESTER

- * Regulatory tire size fitted?
- * Check for firm seating of ground of return-supply pump.
- * Check for firm seating and corrosion of ground of overvoltage-protection relay term. 31.
- * Check for firm seating of ground strap between engine block and vehicle frame.
- * Check for leaks in hydraulic connections at hydraulic modulator and sealing points (visual examination).
- * If the ABS warning lamp lights up intermittently when driving (e.g. after switching on loads) and goes out again by itself, check the battery and power supply (alternator, regulator and voltage drops).
- * If the ABS warning lamp lights up constantly and does not go out, check the following points:
 - Controller plug sitting correctly on controller and latched?
 - All plug contacts O.K.?
 - Spring contacts latched?
 - Check installation position for correct seating of seal ring in controller plug. rounded side downward.

- Check wheel-speed-sensor leads for correct assignment at controller plug:

Wheel-speed sensors:

front left to term. 6 and term. 4.
front right to term. 11 and term. 21.
rear left to term. 8 and term. 9.
rear right to term. 24 and term. 26.
rear axle to term. — and term. —.

- V-belt snapped?
(Alternator provides no voltage, charge-indicator lamp and ABS warning lamp light up).
- * Connect ABS 2 LED tester to ABS wiring harness.
- Disconnect and connect controller only with ignition switched off.
- For testing, switch on ignition in all program-selector-switch positions (tester operates with current supply from vehicle battery).
- Observe LED (green) for current supply in all program-selector-switch positions.

C A U T I O N !

Do not drive with tester connected!

The brake system must be bled of air before the ABS test. Do not activate the ABS tester while the system is being bled.

Repeat the complete test program after any repairs are carried out.

The Antiskid System is a vehicle safety system.

Work on the system demands detailed knowledge of the system.

The conventional brake system must be O.K.

General information for trouble-shooting:

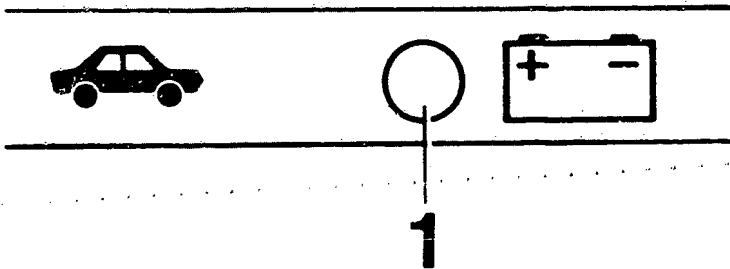
Check all leads for short circuit to ground and contact with positive leads and watch out for worn cable insulation and pinched leads.

RAPID DIAGNOSIS CHART

Never drive with tester connected! Have all test prerequisites been met?

Program-selector-switch positions 1 - 6

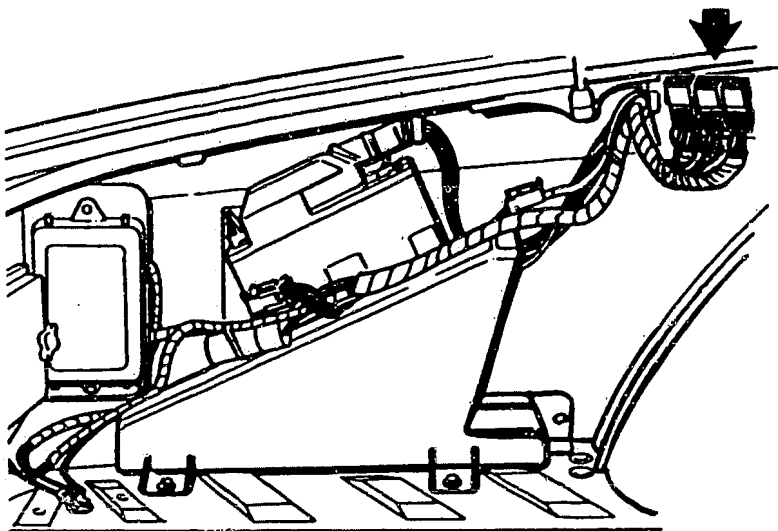
Testing of (measurement at terminals)	Additional operation	Test specification (indication)	Possible causes of trouble
Voltage supply (Term.1 and term.20)	Ignition on	LED 1 (Top picture) lights up constantly	<ul style="list-style-type: none">* Battery not sufficiently charged* Excessive voltage dips. * Check leads from relay plug to controller term.1, to driving switch term.15, to battery B+ and to ground terminal. Check ground lead to controller term.20. * Over-voltage protection relay defective.



265 / 242

1 = LED for supply voltage

Arrow = Overvoltage-protection relay

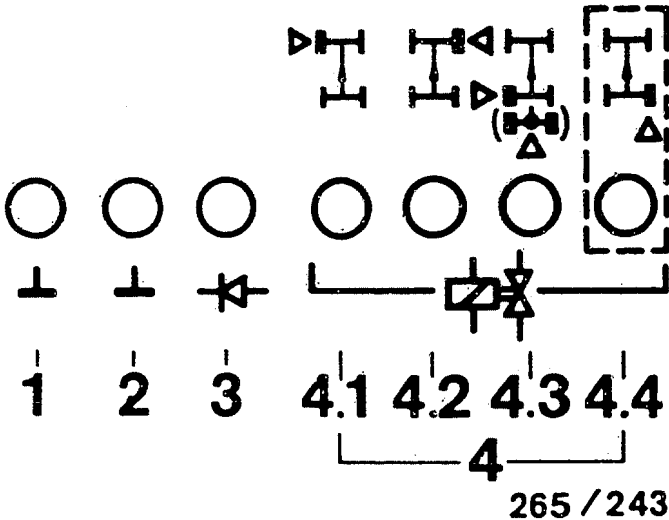


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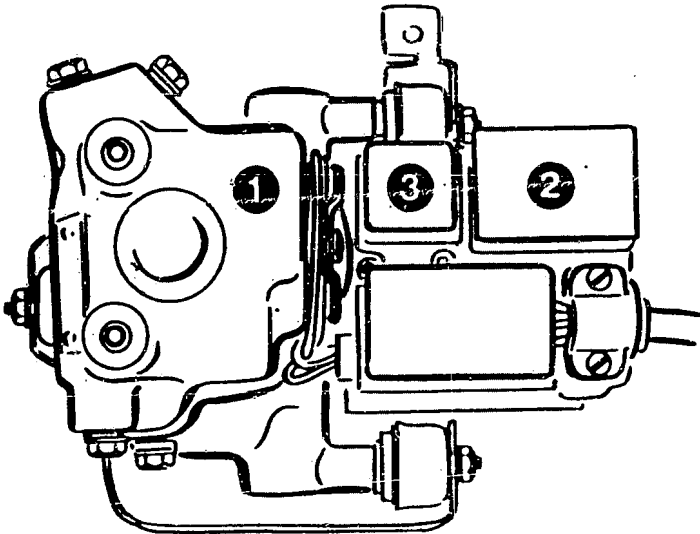
RAPID DIAGNOSIS CHART (CONTINUED)

Program-switch position 1 (3-channel hydraulic modulator)

Testing of (measurement at terminals)	Addition- al operation	Test specifi- cation (reading)	Possible causes of faults
Ground connection (term.10, term.34) Diode for warning lamp (term.29, term.32) Solenoid-operated valve internal res. (term.2, term.35, term.-, term.18) Off-position and ground connection of relay ABS warning lamp	Ignition on	6 LED (1 to 4.3) simultaneously brightly lit (top picture) ABS warning lamp in vehicle must light up	<ul style="list-style-type: none">* LED 1 and/or 2 (top picture) not lit: Check ground terminals for open circuit.* LED 3 (top picture) not lit: Diode defective, check ground connection of valve relay.* One or more LEDs 4 not lit: Check corresponding plug-in connection for solenoid- operated valve and leads.Solenoid-operated valve internal resistance 0,7...1,7 Ω* All LEDs 4 and LEDs 3 not lit: Check ground connection of valve relay, valve relay defective.* Dimmer lighting-up of an LED means contact resistance in the corresponding circuit.* ABS warning lamp not lit: Warning lamp defective. Note: all other 6 LEDs lit.



- 1 = Hydraulic modulator
- 2 = Motor relay
- 3 = Valve relay

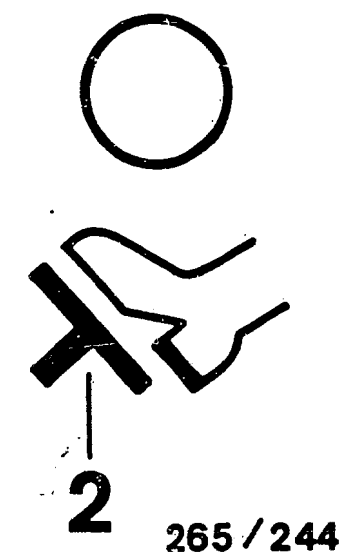


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RAPID DIAGNOSIS CHART (CONTINUED)

Program-selector-switch position 2

Under test (Measurement at the terminals)	Additional operation	Test specification (reading)	Possible causes of trouble
Alternator voltage from term. 61/D+ (term. 15)	Ignition on	LED 1 (top picture) lit.	* In some cases, LED does not go out until after burst of throttle (test is O.K. in this case).
	Start engine	LED 1 (top picture) goes out when engine running	* Test lead and signal from alternator term. 61 * Alternator defective.
Stop-lamp switch (term. 25)	Ignition on	LED 2 (top picture) lit	* Stop-lamp switch defective. * Check lead to stop-lamp switch.
	Press brake pedal	LED 2 (top picture) goes out	* Lead incorrectly connected to to stop-lamp switch.

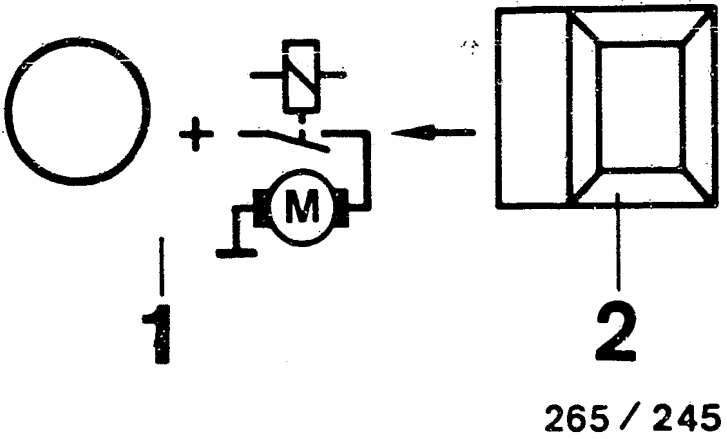


RAPID DIAGNOSIS CHART (CONTINUED)

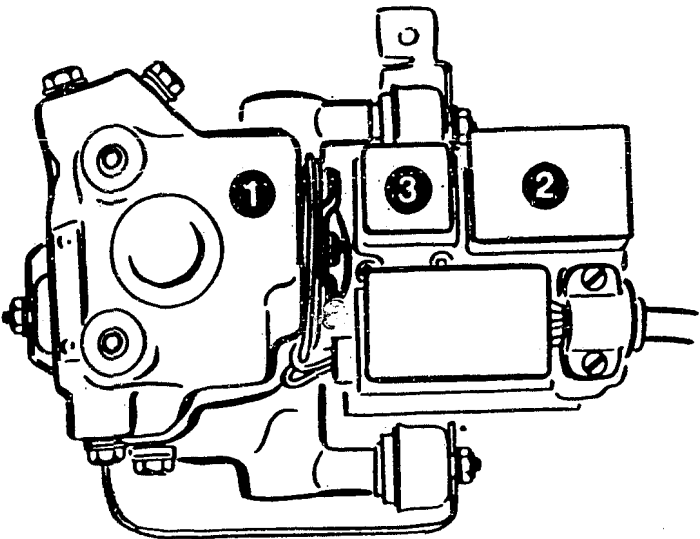
Program-selector-switch position 3

Under test (measurement at the terminals)	Additional operation	Test specification (reading)	Possible causes of trouble
Motor relay, pump motor in hydraulic modulator (term.14 and term.28)	Ignition on, press button 2 contin- uously (top picture)	LED 1 lights up, pump motor runs. After releasing button, LED con- tinues to light due to run-on of motor (top picture).	<ul style="list-style-type: none">* Motor relay defective* Test ground connection and positive terminal of pump motor* Test following leads: From controller term. 14 and term. 28 to hydraulic modulator term. 9 or term. 11. Positive leads to hydraulic modulator term. 10 and term. 12.* Pump motor or hydraulic modulator defective.

Program-selector-switch position 4 does not apply.



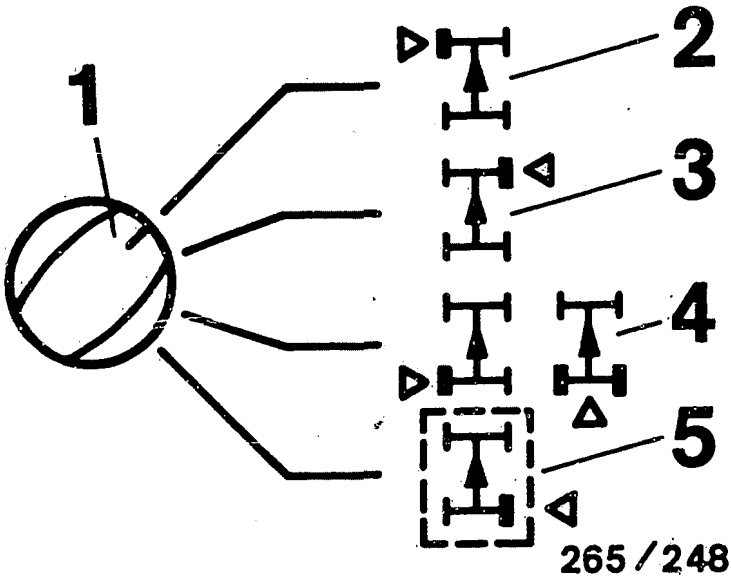
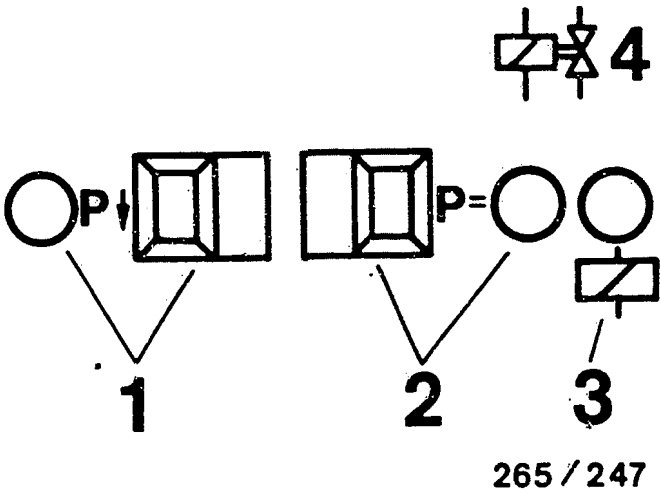
1 = Hydraulic modulator
2 = Motor relay
3 = Valve relay



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RAPID DIAGNOSIS CHART (CONTINUED)
Program-selector-switch position 5 (3-channel hydraulic modulator)

Under test (measurement at the terminals)	Additional operation	Test specification (reading)	Possible causes of trouble
Valve-relay opera- tion (term.27)	Ignition on	LED 3 (upper illustration) lights up	*Valve relay (winding) or leads defective
Solenoid-operated valve in hydraulic modulator for operation and mix-up. NOTE: Check each wheel separately in turn. Keep to operating sequence!	Choke up vehicle. Ignition on. The wheel being tested must be freely turnable by hand. Set switch 1 for wheel selection to wheel to be tested. For the rear axle, set to position 4 (lower illustration).		* Repeat test with engine running * Valve relay (make contact) defective * Break in line from valve relay term. 87 to batt. +ve * Brake leads at hydraulic modulator mixed up
Operation pressure holding	1. Constantly press push- button P= (lower illus.)	LED P= (lower illus.) lights up	* Current value not obtained (LED P arrow or P= goes out; upper illustration): battery insufficiently charged. Repeat check with engine running.
	2. Constantly depress brake pedal	Wheel turnable by hand	
	3. Release push- button P= (upper illustration)	LED P= goes out (upper illus.) Wheel locks	
Operation pressure reduction	4. Press push- button P arrow (upper illustration)	LED P arrow (upper illustration) lights up, wheel turnable by hand	* Solenoid-op. valves correct- ly connected electrically? Wheel, front left: term. 2 Wheel, front right: term.35 Wheel, rear left: term.— Wheel, rear right: term.— Rear axle: term.18 * Hydraulic modulator defective
	5.Release push- button P arrow (upper illustration)	LED P arrow (upper illus- tration) goes out, wheel locks	
	6.Release brake pedal		

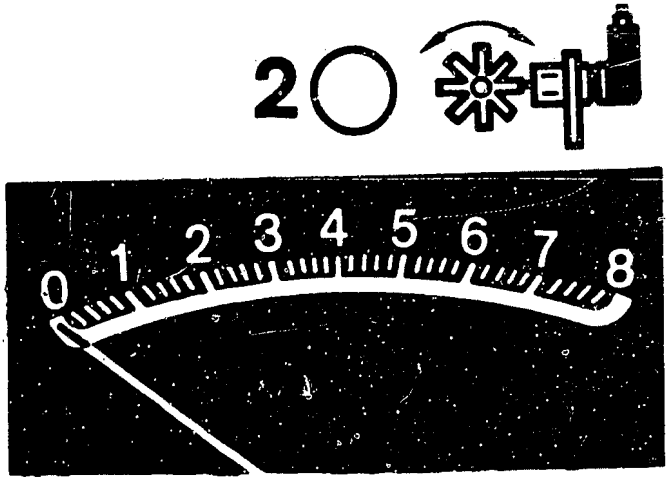
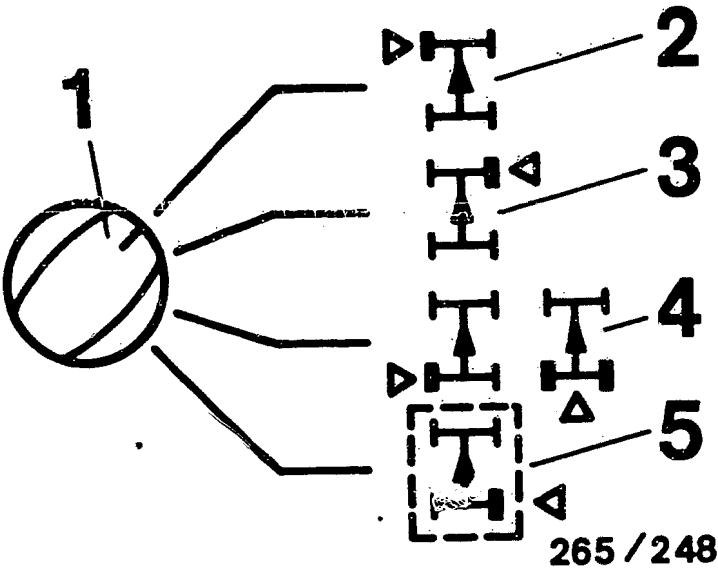


RAPID DIAGNOSIS CHART (CONTINUED)

Program-selector-switch position 6 (4 wheel-speed sensors)

Testing of (measurement at terminals)	Additional operation	Test specification (indication)	Possible causes of fault
<p>Wheel-speed sensors for proper func- tioning and mix-up</p> <p>NOTE: Perform test consecutively for each individual wheel. Important: Refer to "Special features" when testing wheel-speed sensors at rear axle, since wheels cannot be turned by hand on account of differential lock</p> <p>Wheel, front left: t. 6 and t. 4</p> <p>Wheel, front right: t. 11 and t. 21</p> <p>Wheel, rear left: t. 8 and t. 9</p> <p>Wheel, rear right: t. 24 and t. 26</p>	<p>Jack up vehicle. Ignition on.</p> <p>It must be possible to turn the wheel to be tested freely by hand</p> <p>The wheel not being tested must be held when testing the driven axle.</p> <p>Set switch for wheel selection to wheel to be tested (bottom picture)</p> <p>Turn wheel by hand until LED 2 above instrument lights up without flickering. (Speed approx. 1 revolution per second). Then read off indication on instrument: (top picture)</p>	<p>1. Smallest reading greater than 1,6 scale divisions</p> <p>2. Permissible fluctuation max. 25 % from maximum displayed value.</p>	<p>*Wheel-speed-sensor lead mixed up</p> <p>*Open circuit in wheel- speed-sensor lead</p> <p>*Wheel-speed sensor defective Winding resistance: Front axle: 0,6...1,6 k Ω Rear axle: 0,6...1,6 k Ω</p> <p>*Air gap between wheel- speed sensor and ring gear too large</p> <p>*Ring gear defective or loose</p> <p>*Ring gear with wrong number of teeth fitted Front axle: 48 teeth Rear axle : 48 teeth</p> <p>*Wheel-bearing clearance too large</p> <p>*Indication given, LED 2 does not light up: Loose contact in wheel- speed-sensor lead.</p>

Continue testing on next Coordinate.



TEST SPECIFICATIONS

Wheel-speed sensor		
* Winding resistance at ambient temperature (-10°C...+120°C) for front axle:	600...1600	Ω
rear axle:	600...1600	Ω

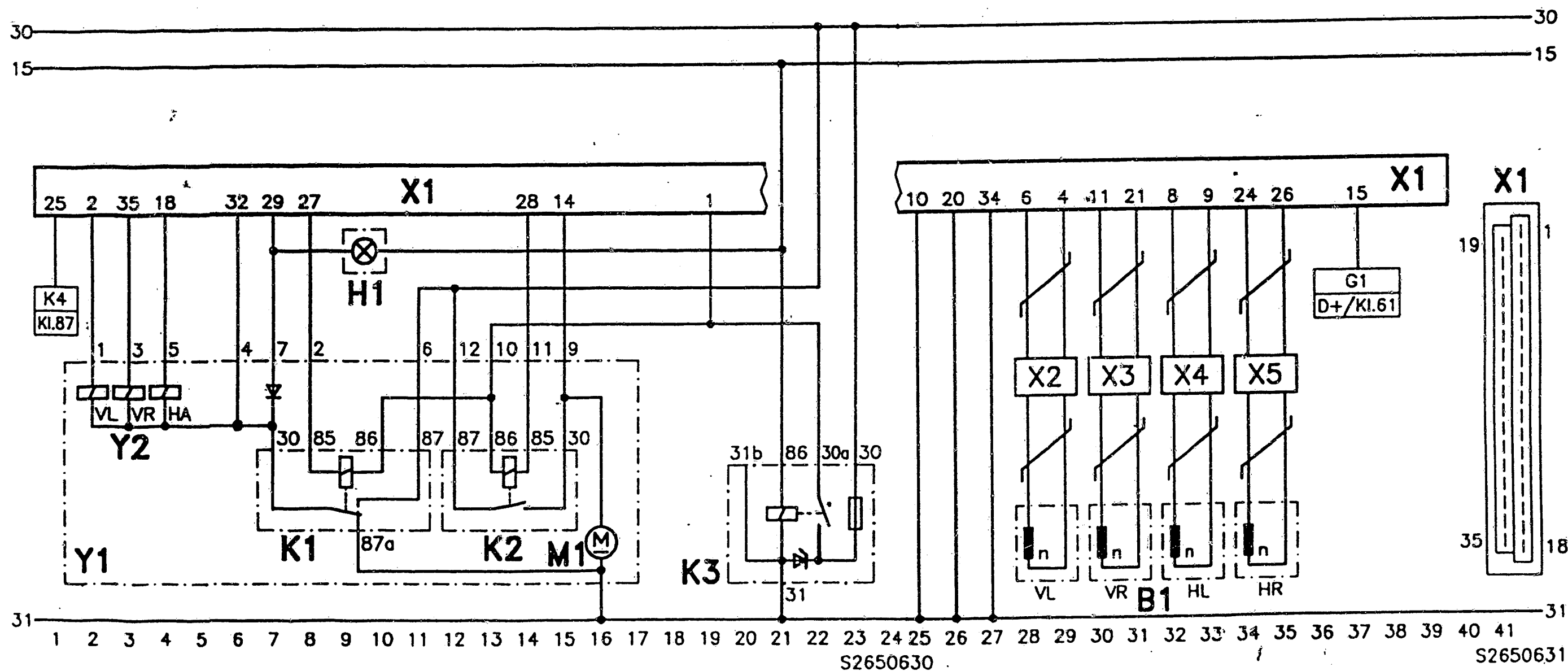
Hydraulic-modulator solenoid-operated valves		
* Winding resistance at ambient temperature (-10°C...+120°C):	0,7...1,7	Ω

Air gap between wheel-speed sensor and ring gear		
* at front wheels : slide in wheel-speed sensor as far as it will go		
* at rear wheels : slide in wheel-speed sensor as far as it will go		

Tightening torque for		
* Fastening screws of the wheel-speed sensors:	> 8	Nm
* Brake-line connections on the hydraulic modulator:	12...16	Nm

Number of teeth on wheel-speed-sensor ring gears		
* Front axle:	48	teeth
* Rear axle:	48	teeth

For production reasons:
continued on the following
coordinate.



ELECTRICAL TERMINAL DIAGRAM

B1 = Wheel-speed sensor
 G1 = to alternator
 H1 = ABS warning lamp
 K1 = Valve relay
 K2 = Motor relay
 K3 = Over-voltage protection relay
 K4 = Stop-lamp simulation relay

M1 = Return-pump motor
 S1 = Stop-lamp switch
 X1 = Controller plug (35-pole)
 X2...X5 = Multiple butt connector
 Y1 = Hydraulic modulator
 Y2 = Solenoid valves

VL = Front left
 VR = Front right
 H = Rear axle
 HL = Rear left
 HR = Rear right

H21 —————>

H22 —————<==

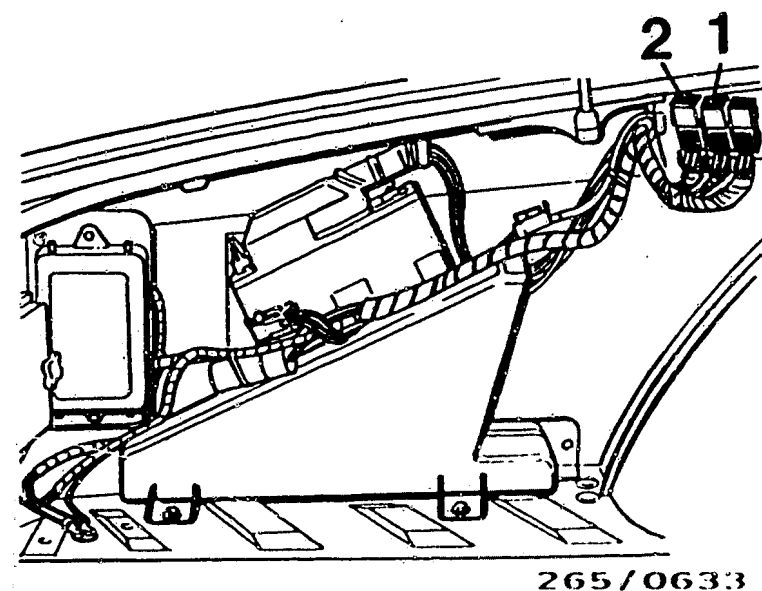
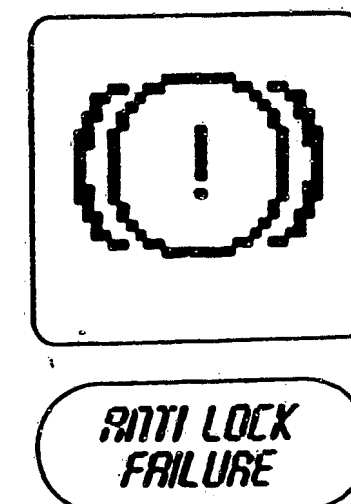
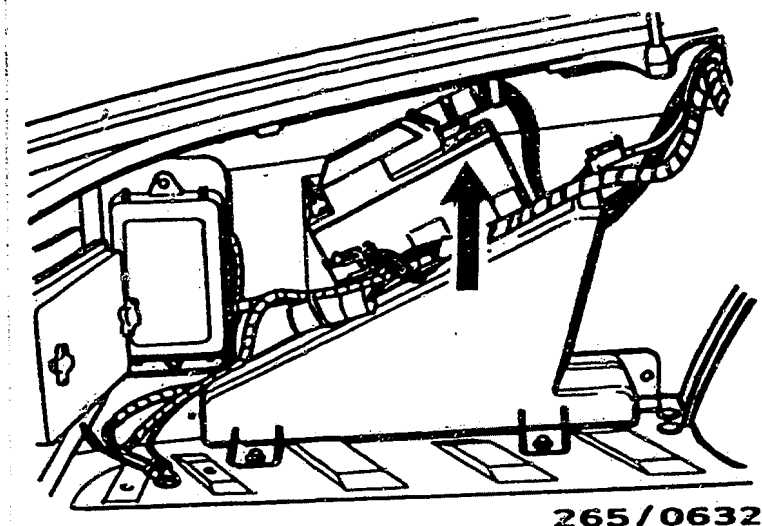
INSTALLATION POSITION OF COMPONENTS

The stated installation locations always refer to the direction of travel.

- * Controller: arrow, top picture
In trunk on left-hand side behind trim

- * ABS warning lamp: symbol, center picture
A symbol with a yellow border and beneath it the words ANTI LOCK FAILURE are displayed on the right-hand side of the instrument panel:

- * Over-voltage protection relay 1 : bottom picture
Stop-lamp simulation relay 2 : bottom picture
In trunk on left-hand side above wheel arch.



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Hydraulic modulator: top picture

In engine compartment in direction of travel, right in vicinity of bulkhead.

The hydraulic modulator is not to be repaired, but rather only replaced as a complete unit.

Exception: relay change.

* ABS ground terminal: not illustrated

In trunk, left in vicinity of ABS controller.

* Wheel-speed sensor, front axle: center picture

One wheel-speed sensor each on inside (anchor plate) of left and right front wheel.

Insert wheel-speed sensor as far as it will go into hole, do not knock into position.

Wheel-speed-sensor plug connections:

In direction of travel, left and right on fender in vicinity of bulkhead.

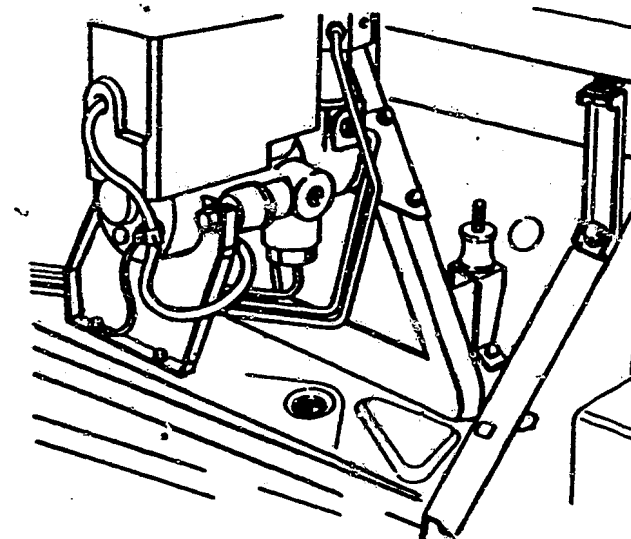
* Wheel-speed sensor, rear axle: bottom picture

One wheel-speed sensor each inserted from above into axle beam of left and right rear wheel.

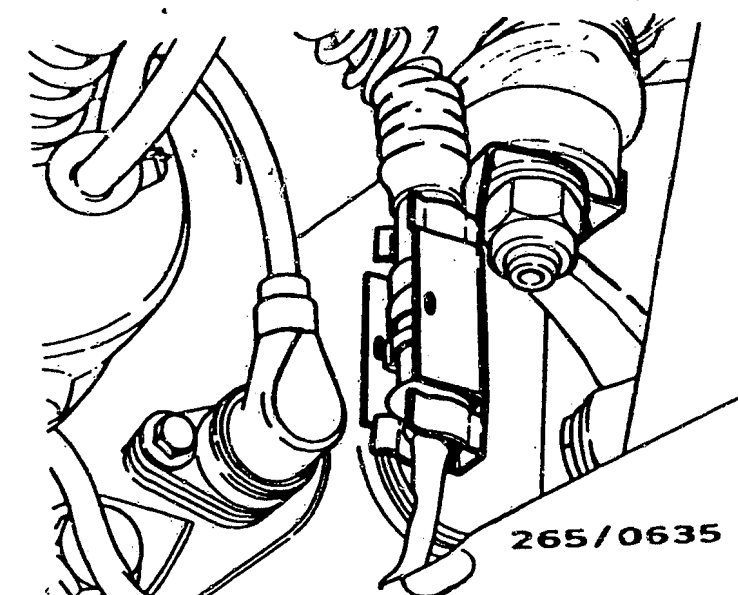
Insert wheel-speed sensor as far as it will go into hole, do not knock into position.

Wheel-speed-sensor plug connections:

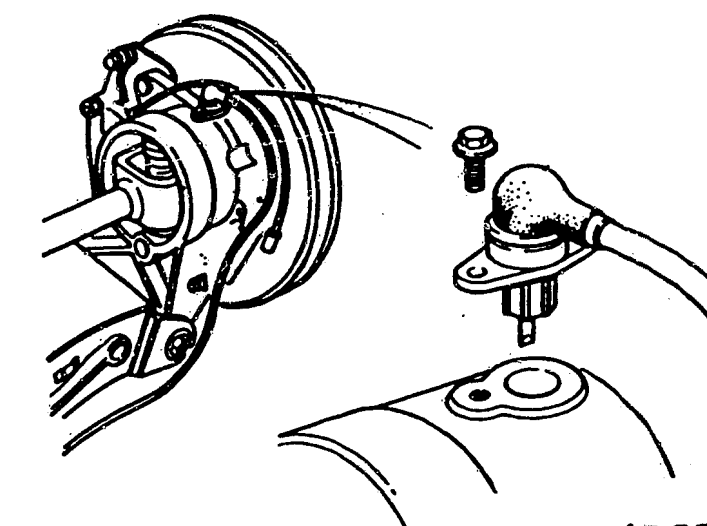
On left and right behind front lining in trunk.



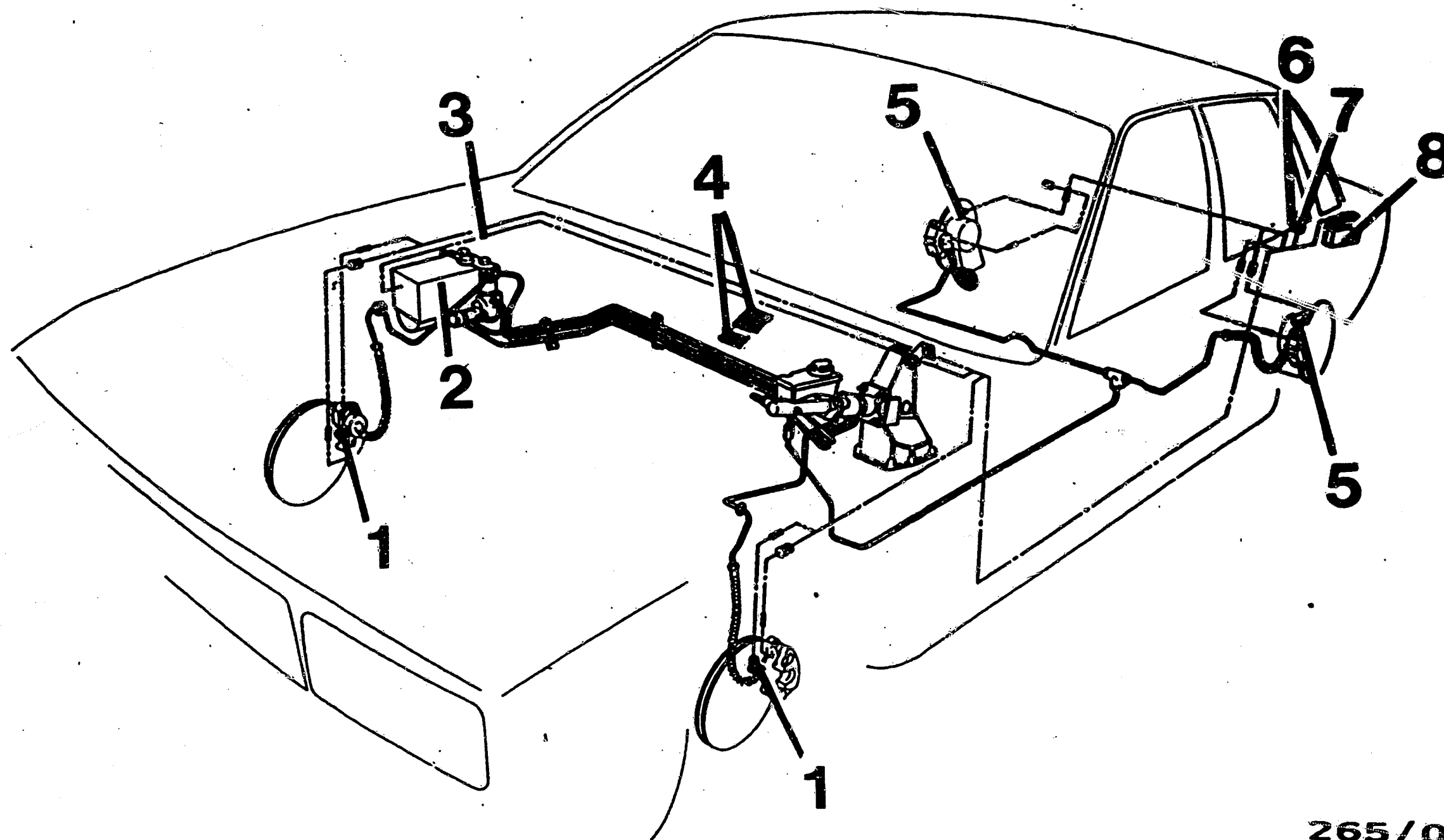
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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

- 1 = Wheel-speed sensors, front axle
- 2 = Hydraulic modulator
- 3 = ABS wiring harness
- 4 = ABS warning lamp (symbol and text)

- 5 = Wheel-speed sensors, rear axle
- 6 = Over-voltage protection relay
- 7 = Stop-lamp simulation relay
- 8 = ABS controller

Trouble-shooting instructions : VWV-5008
BOSCH system : KE-Jetronic 2.5
Make of vehicle : NISSAN
Basic microcard : KFZ-00..

TABLE OF CONTENTS

Section	Coordinates
Special features	02
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Safety and precautionary measures	04
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Rapid diagnosis chart	08
Electrical terminal diagram	14
Diagram of air and fuel lines	15
Installation position of components, notes on removal and installation	16

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following vehicle model:

NISSAN Santana 03.86->
with 2.0 l / 5-cylinder engine
80 kW (110 bhp)

- * KE 2.5 - Jetronic
- * Lambda closed-loop control
- * Low-idle-speed control
- * Overrun cut-off
- * Injection valves with fixed air-guide cap. Connection of the tester for delivered quantity comparison with adapter sleeves KDJE-P 200/19.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.

For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION! Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to prevent damage to the engine, trigger boxes and control units or to the ignition system, be sure to observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

For testing the compression, disconnect the pump relay in order to prevent undesired injection by the injection valves.

Important information with regard to working on the KE Jetronic.

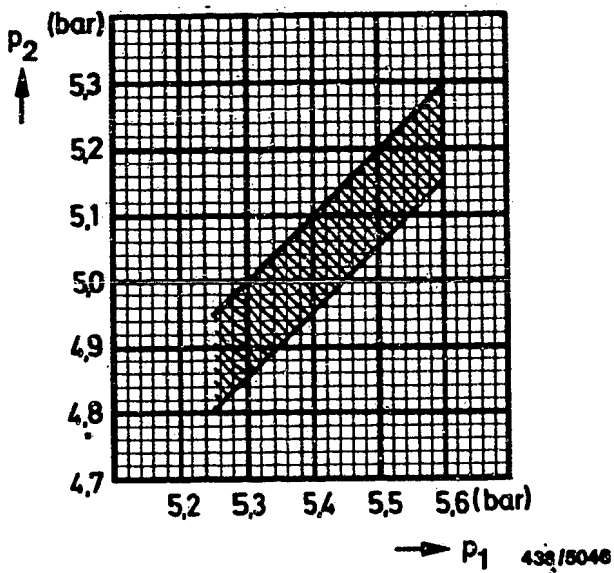
If any fuel connections are loosened or parts removed, also on the vacuum system, always use new seals when re-connecting or re-mounting.

Be sure to keep everything clean when working on the KE-Jetronic. Clean the external areas of fuel connections thoroughly before loosening them.

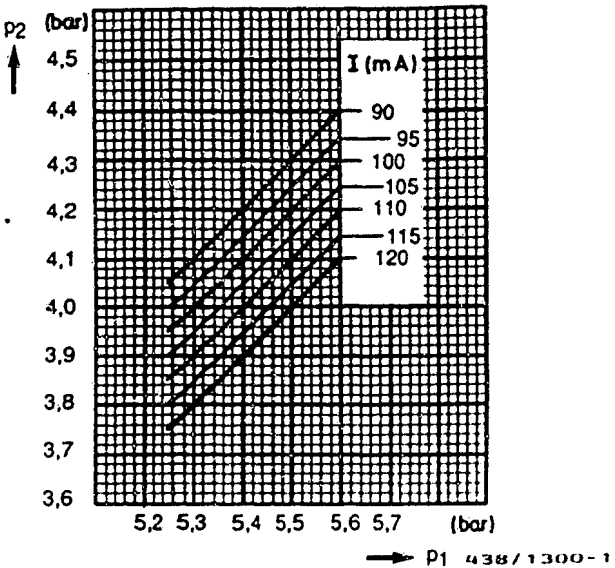
While conducting tests with the electric fuel pump running, never deflect (lift) the air-flow sensor plate, since this leads to fuel being injected via the injection valve. This may lead to very serious damage to the engine, when the engine is started afterwards.

TEST SPECIFICATIONS

No.	Test/Test condition	Test specification	
1	Electric fuel pump – delivery quantity:	min. 1000 cm ³ /min	
2	Primary pressure:	5,25...5,6 bar	
3	Differential pressure: Get lower-chamber pressure "warm" nominal value from the upper diagram corresponding to the measured primary press. (actuator current 10mA). Get the lower-chamber "cold" nominal pressure from the lower diagram corresponding to the measured primary pressure and actuator current. Tolerance ± 0.15 bar. Simulation of the "cold" state: pull the cable plug on the engine temperature sensor.		
4	Sealing test – entire system: Minimum pressure after 10 min.: Minimum pressure after 20 min.:	2,7 bar 2,6 bar	
5	Fuel-injection valve opening pressure:	3,0...4,1 bar	
6	Delivery quantities – comparison measurement: (actuator current 10 mA) Idle: Part load: Full load: Minimum quantity at max. sensor-plate deflection	Setting point: (cm ³ /min)	Max. allow. quantity: (cm ³ /min)
		6,0 40,0 100,0	6,6 42,8 109,0
		120 cm ³ /min	



p 1 = Primary pressure
p 2 = Lower-chamber pressure
I = Actuator current



TEST SPECIFICATIONS (CONTINUED)

No.	Test/Test condition	Set values	
7	Flow quantity, KE throttle:	120...145 cm ³ /min	
8	Temperature sensor (engine) NTC Engine cold (+15...+30°C): Engine warm (approx. +80°C):	1,3...3,6 k Ω 250...390 Ω	
9	Thermo-time switch, resistance measurement:	Below +10°C	Above +20°C
	Terminal G and ground:	50...70 Ω	50...70 Ω
	Terminal W and ground:	0 Ω	infinity Ω
	Terminal G and terminal W:	50...70 Ω	infinity Ω
10	Idle-mixture-adjusting screw, basic setting:		
	Fuel-distributor seat - needle-roller bearing:	21,2...21,4 mm	
11	Air-flow-sensor potentiometer:		
	Voltage signal, basic setting of air-flow sensor plate:	0,01...0,05 V	
12	Idle-speed adjustment: *)		
	Idle speed: (Controlled by idle-speed control)	800...920 min ⁻¹	
	On/off ratio to be set: (bypass screw)	27...29 %	
	Exhaust-gas adjustm. via pressure-act. current: Test specification:	4...16 mA	
	Setting:	9...11 mA	
	CO content in exhaust gas (check value):	0,3...3,0 % by vol.	

*) Refer also to following page

TEST SPECIFICATIONS (CONTINUED)

*) Instructions for idle adjustment:

Exhaust-gas regulation is accomplished automatically by the lambda closed-loop control. The pressure-actuator triggering current in closed-loop operation (oscillating current reading) is tested. If the current reading is outside of the test specification, correct to the setting value by turning the idle-mixture-adjusting screw.

The CO control value is used to test whether there is any leakage in the exhaust system. Measure at the exhaust sampling pipe to the right of the intake manifold.

Switch off all electrical consuming devices as well as the air conditioner before idle testing. The radiator fan must not be running. Remove the PCV on the cylinder cover and leave open.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER
ETT 018.01 WITH KE2 ADAPTER CABLE 1 684 463 135 AND
SUITABLE MULTIMETER:

The following rapid diagnosis chart makes it possible for the experienced Jetronic specialist to rapidly test the electrical/electronic peripheral and control-unit functions of the KE-Jetronic, including lambda closed-loop control.

Important information concerning the following rapid diagnosis chart:

The "test conditions" column specifies the test steps during which the control-unit plug must be connected or disconnected. Great care must be taken to ensure that the system is without current during all plugging and unplugging operations, i.e. the ignition must be switched off and the electrical safety circuit must not be bridged.

The "test connections" column indicates the leads in the current path for the measurement being made, with reference to the pin assignment of the control-unit plug. Any trouble-shooting that may be required will involve these leads.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/But. V	Ω Bt n.	Test of	Test con- nections	Test conditions	Test specifications
1	V	4	-	12 - 10	Disconnect control-unit plug.	20...30 Ω
2	V	5	-	21 - 2	Control-unit plug disconnected. Engine temperature +15...+30°C; approx. +80°C:	1.3...3.6 k Ω 250...390 Ω
3	V	11	-	20 - 2	Control-unit plug disconnected.	0...10 Ω
4	V	9	-	13 - 2	I m p o r t a n t : Voltage measurement; voltmeter connection: Negative = black socket "V" Positive = left blue socket " Ω " Control-unit plug disconnected. Switch on ignition. Throttle plate closed: Throttle plate open:	8...15 V 0 V
5	V	10	-	5 - 2	I m p o r t a n t : Voltage measurement; voltmeter connection: Negative = black socket "V" Positive = left blue socket " Ω " Control-unit plug disconnected. Ignition switched on. Throttle plate closed: Throttle plate fully open:	0 V 8...15 V
6	3	—	-	16 - 2	Control-unit plug disconnected. Switch on ignition. Switch on air conditioner:	8...15 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/But. V	Ω	Bt n.	Test of	Test con- nections	Test conditions	Test specifications
7	4	—	—	Start signal, terminal 50	24 - 2	Control-unit plug disconnected. Operate starting motor:	8...15 V
8	5	—	—	Ignition TD signal	25 - 2	Control-unit plug disconnected. Operate starting motor for a few seconds:	Voltage undefined
9	6	—	—	Control unit - supply	1 - 2	Control-unit plug disconnected. Switch on ignition.	8...15 V
10	7	—	—	Supply, air-flow sensor potentiometer	18 - 2	Connect control unit. Switch on ignition.	7...8 V
11	8	—	—	Signal, air-flow sensor potentiometer	17 - 2	Control unit connected. Switch on ignition. Sensor plate at rest: Deflect sensor plate by hand, continuous voltage rise to max. :	approx. 0 V 8 V
12	10	—	—	Idle actuator Supply and continuity, winding 1	3 - 2	Switch off ignition. Disconnect control-unit plug. Switch on ignition.	8...15 V
13	11	—	—	Idle actuator, continuity, winding 2	4 - 2	Control-unit cable plug disconnected. Switch on ignition.	8...15 V
14	12	—	—	Air-conditioner compressor signal	19 - 2	Switch off ignition. Connect control unit. Start engine and switch on air conditioner. Compressor not running: Compressor running:	0 V 8...15 V

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

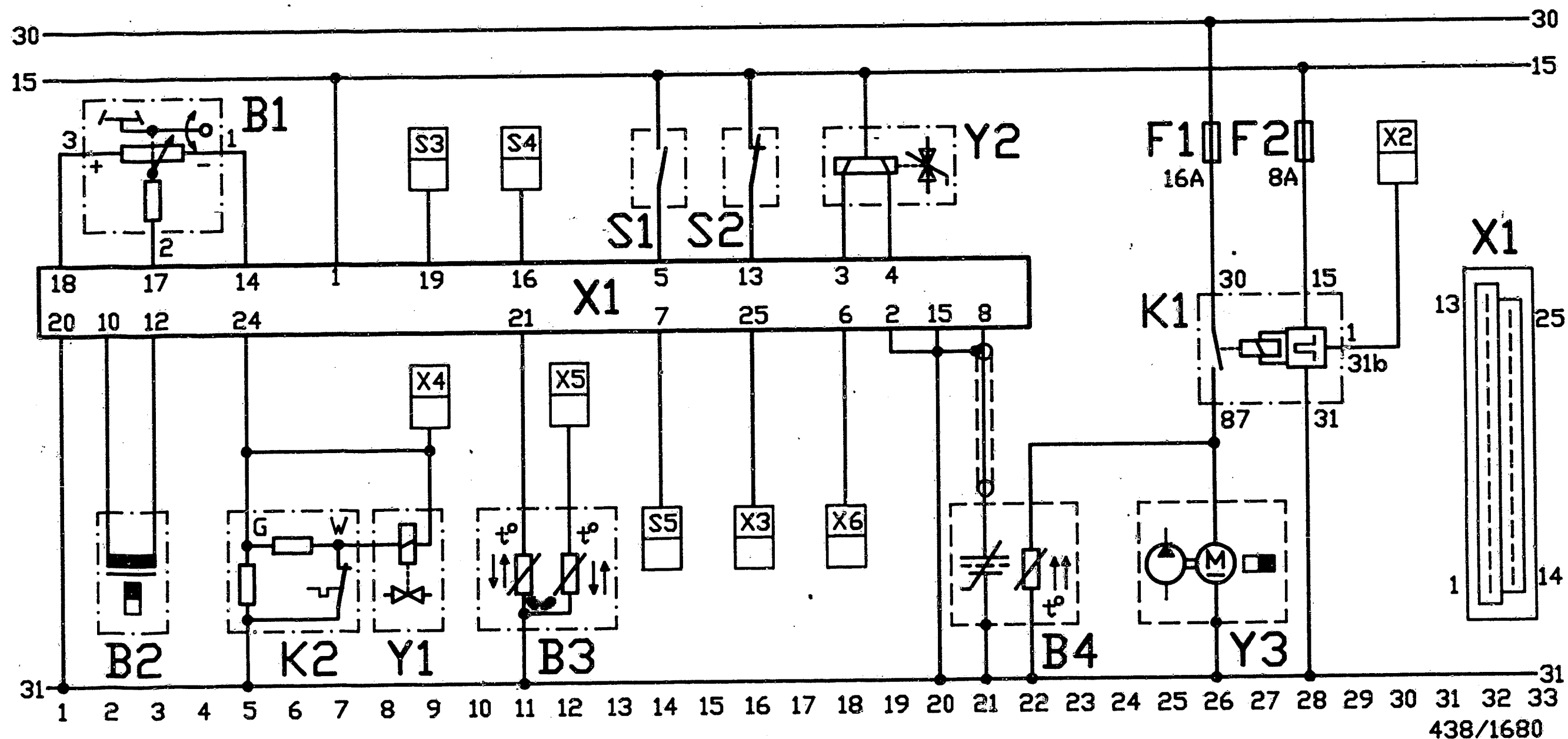
No.	Switch V	Ω	TA TA	Function tested	Test conn- ections	Test conditions	Set values
15	14	24	-	Lambda closed-loop control Control function	23 - 2	Control unit connected. Jumper sockets 1 and 2 on test adapter. Engine at operating temperature, run at idle. Control function: oscillating voltage indication. Average value:	Approx. 3 V
16	-	-	1	Warm-up enrichment -20°C	12 - 12	Current measurement! To connect meas. instrument: Negative = Black socket 1 Positive = Black socket 2 Control unit connected. Switch on ignition.	60... 80 mA
17	-	-	2	Actuator current Engine at operating temp.	12 - 12	Control unit connected. Switch on ignition.	9... 11 mA
18	-	-	1 /4	Post-start enrichment	12 - 12	Control unit connected. Switch on ignition. Hold button 1 pressed: Press button 4. Current rises to: After holding steady for a short time, regulate slowly down to:	60... 80 mA 130...160 mA 60... 80 mA
19	-	-	1 /6	Acceleration enrichment	12 - 12	Control unit connected. Switch on ignition. Hold buttons 1 and 6 pressed. Current value: Quickly deflect air-flow sensor plate. Current rises to: Regulation in approx. 1 second down to:	60... 80 mA 110...160 mA 60... 80 mA

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch V	Ω	/TA TA	Functions tested	Test conn- ections	Test conditions	Set values
20	-	-	2	Overrun cutoff	12 - 12	Control unit connected. Reconnect ammeter (reverse positive and negative). Start engine. Keep engine speed n at approx.: While holding button 2 pressed, actuate throttle-valve switch (idle). Current indication during phase of falling engine speed: Reconnect ammeter again.	2000 min ⁻¹ -30...-60 mA
21	-	-	-	Full-load enrichment	12 - 12	Control unit connected. Start engine and keep engine speed n at approx.: Actuate throttle-valve switch (full load). Current rises to:	2500 min ⁻¹ 6...10 mA
22	-	24	-	Lambda closed-loop control Control function	12 - 12	Control unit connected. Engine at operating temperature, run at idle. Closed-loop-control operation can be recognized by oscillating current indication. Average value: If average value is outside tolerance limits, adjust (idle-mixture-adjusting screw) to:	4...16 mA 9...11 mA
23	-	22	-	Lambda closed-loop control Rich stop	12 - 12	Control unit connected. Switch on ignition. Current rises to:	18...22 mA
24	-	23	-	Lambda closed-loop control Lean stop	12 - 12	Control unit connected. Switch on ignition. Current drops to:	0... 2 mA

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (CONTINUED)

No.	Switch/ V	But. Ω	Bt n.	Test of	Test con- nections	Test conditions	Test specifications
25	10	-	-	Low-idle-speed control		<p>Control unit connected. Test with lambda closed-loop control tester. Bridge black sockets 1 and 2 on test adapter.</p> <p>7 Engine idling at normal operating temperature. Idle speed (regulated): On-off ratio at idle speed: If necessary, adjust on-off ratio (bypass screw on throttle-valve assembly).</p> <p>Switch on air conditioner (compressor). Engine speed:</p>	<p>800...920 min ⁻¹ 27... 29 %</p> <p>800...920 min ⁻¹</p>



B1 = Air-flow-sensor potentiometer

B2 = Pressure actuator

B3 = Temperature sensor (engine)

B4 = Lambda sensor

F1 = Fuse (16 A)

F2 = Fuse (8 A)

K1 = Electric-fuel-pump relay

K2 = Thermo-time switch

S1 = Throttle-valve switch (full load)

S2 = Throttle-valve switch (idle)

S3 = Connection of air-conditioning compressor

S4 = Connection of air-conditioning standby

S5 = Connection of gear-shift switch
(with automatic transmission only)

X1 = Connector, KE control unit

X2 = Ignition coil, terminal 1

X3 = TD signal

X4 = Starting motor terminal 15a

X5 = Signal, air-conditioning standby

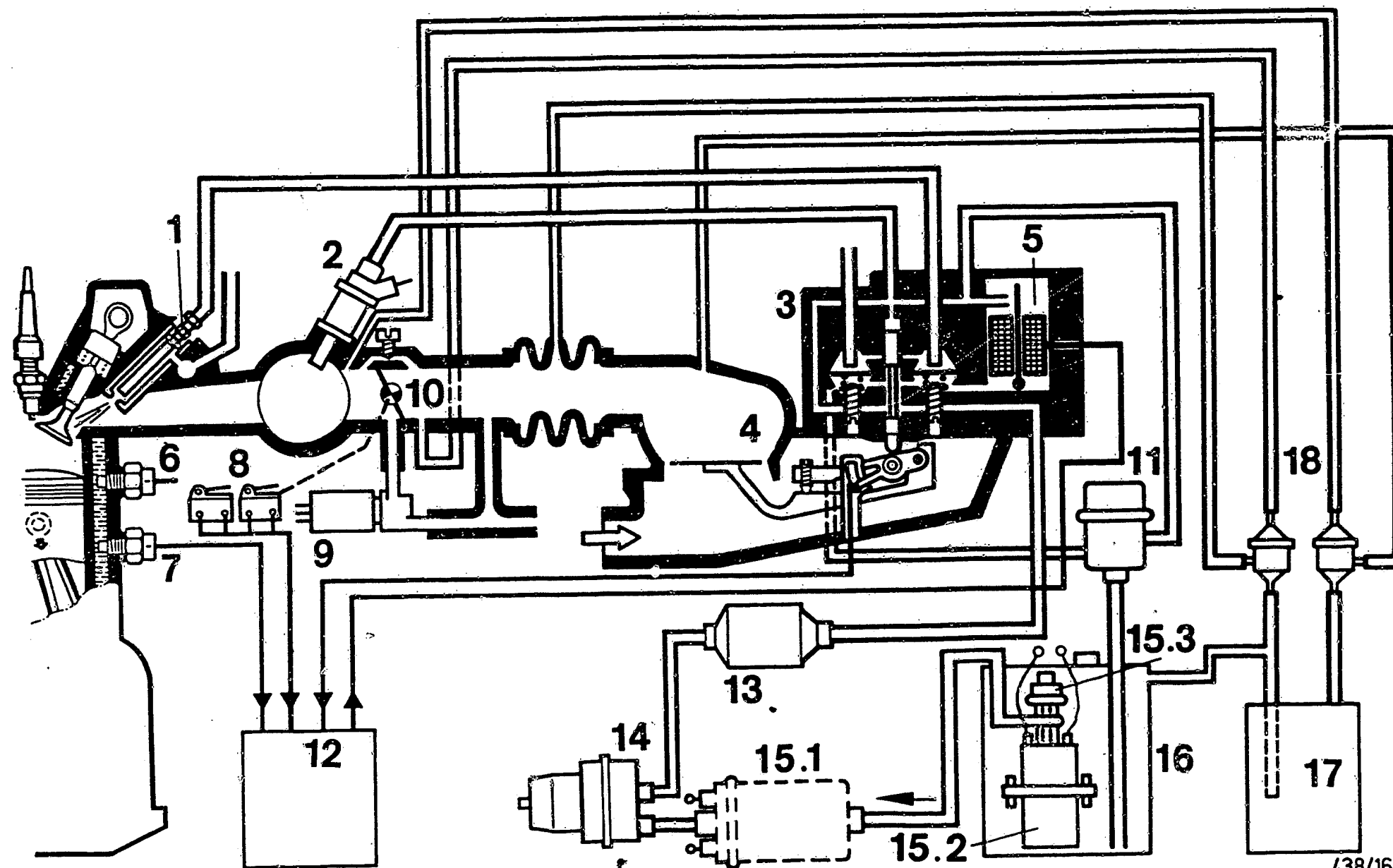
Y1 = Start valve

Y2 = Electric fuel pump

ELECTRICAL TERMINAL DIAGRAM

J21 — ==>

J22 — <==



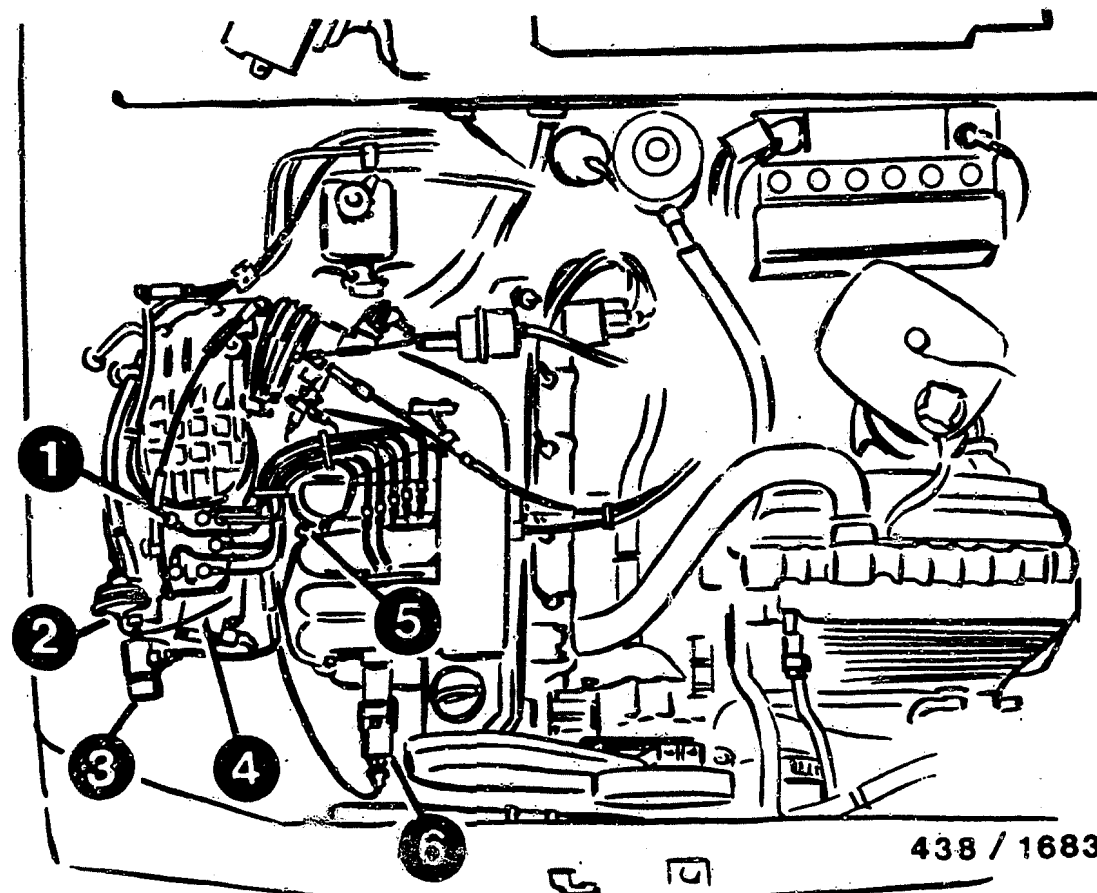
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- 1 = Injection valve
- 2 = Cold-start valve
- 3 = Fuel distributor
- 4 = Air-flow sensor
- 5 = Pressure actuator
- 6 = Thermo-time switch
- 7 = Temperature sensor (engine)
- 8 = Throttle-valve switch
(idle, full load)

- 9 = Idle actuator
- 10 = Throttle valve
- 11 = Primary-pressure regulator
- 12 = Control unit, KE-Jetronic
- 13 = Fuel filter
- 14 = Fuel accumulator
- 15.1 = Electric fuel pump
(Audi 90, Coupe, 4000)

- 15.2 = In-tank electric fuel pump
(Audi 100, 5000, Santana)
- 15.3 = Pressure damper
(Audi 100 only)
- 16 = Fuel tank
- 17 = Activated-carbon canister
- 18 = Tank-ventilation switching valves

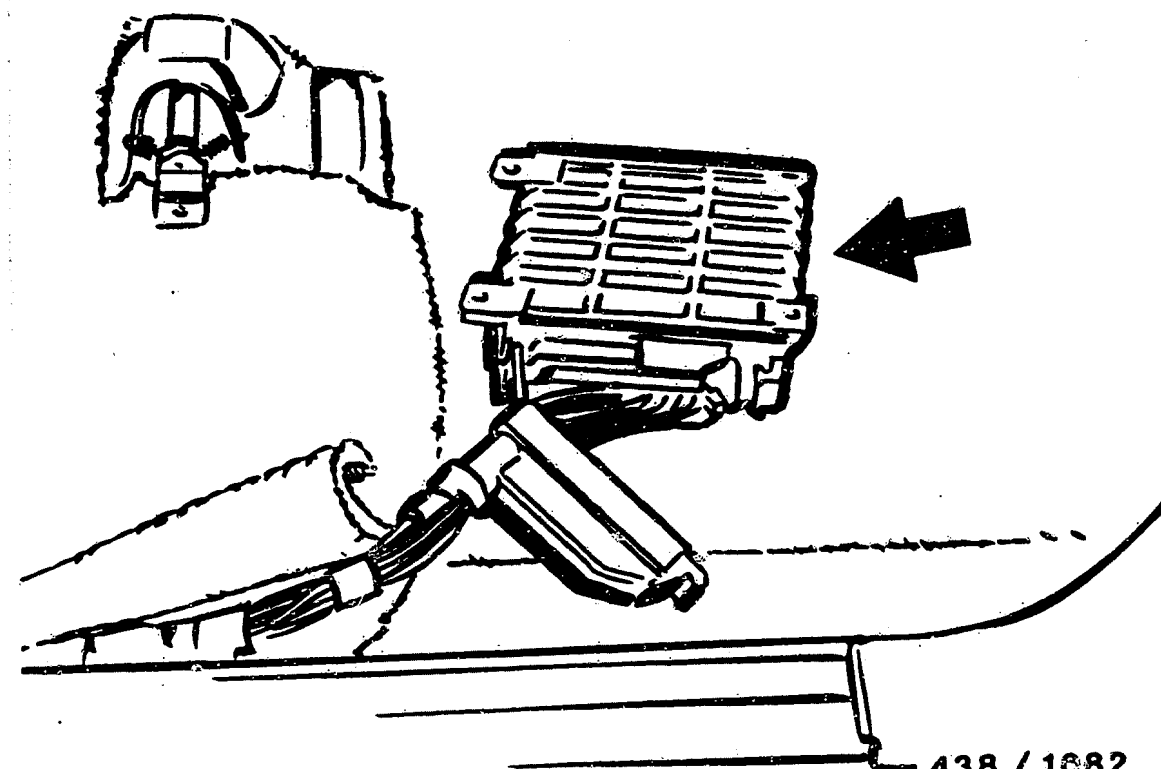
DIAGRAM OF AIR AND FUEL LINES



438 / 1683

- 1 = Mixture-control unit
- 2 = Tank-ventilation valve
- 3 = Pressure regulator
- 4 = Pressure actuator
- 5 = Cold-start valve
- 6 = Idle actuator

INSTALLATION POSITION OF COMPONENTS

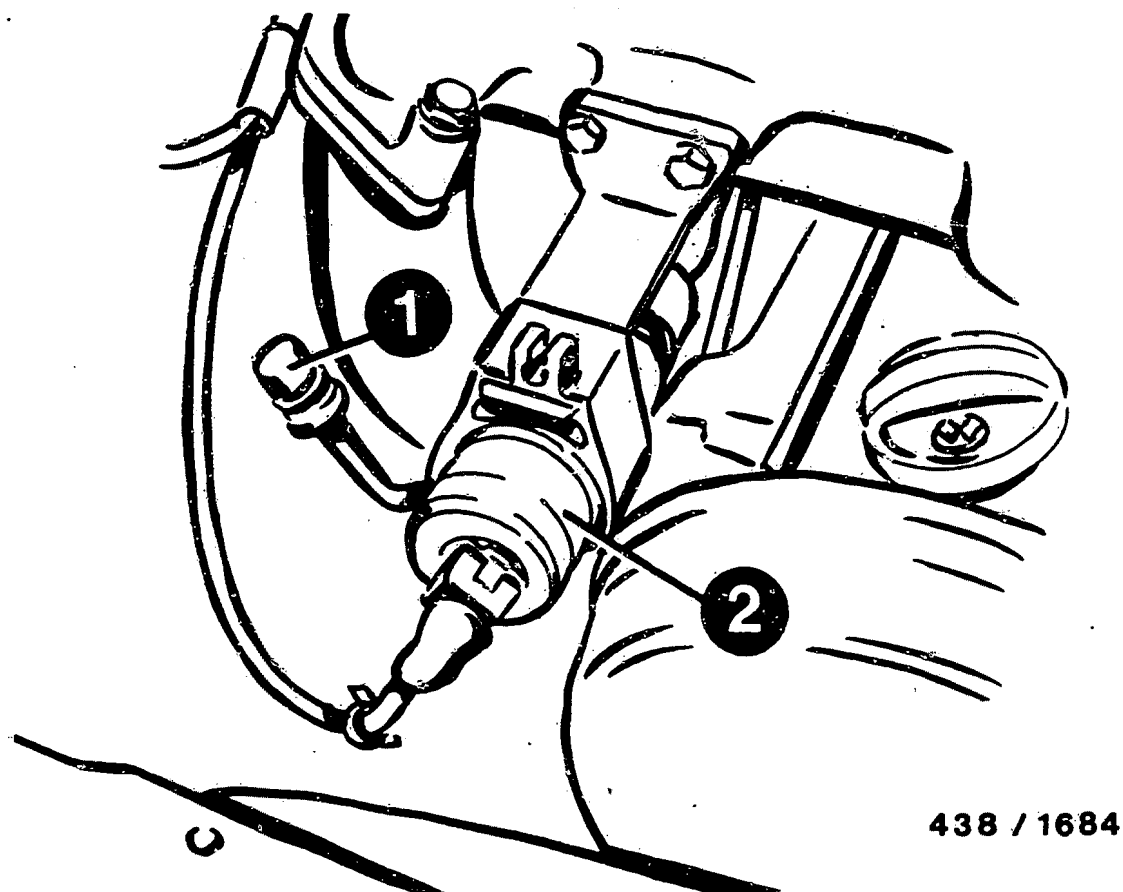


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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The KE control unit is located beneath the passenger seat.

Access to the KE control unit is gained by pulling back the footwell mat.



- 1 = Idle actuator
2 = Connecting pipe for exhaust-gas measurement

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Fuel filter and fuel accumulator are located near to the rear axle.

For production reasons:
continued on the following
coordinate.

Trouble-shooting instructions : BMW-5029

BOSCH system : Electronically controlled diesel fuel injection (EDC = Electronic Diesel Control)

Make of vehicle : BMW

Basic microcard : KFZ-00..

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Section	Coordinates
Special features.....	02
Structure, usage.....	04
Safety and precautionary measures.....	04
Trouble-shooting chart.....	05
Test specifications.....	10
Self-diagnosis test table.....	11
Electrical terminal diagram.....	23
Installation position of components.....	25

SPECIAL FEATURES

These trouble-shooting instructions, valid at the time of publication, apply to the following BMW model:

324 d (E30)
with electronically controlled diesel fuel injection (EDC = Electronic Diesel Control)

Engine: M 21 D 24 W, 64 kW
EU; 03.89

Vehicles of country versions
- Austria
- Switzerland
are additionally equipped with an EGR system.

* EDC system EDC 1.2.1 with self-diagnosis and 55-pole control-unit plug.

* The fault memory can be read out using the Pocket System Tester KTS 300 (0 684 400 300) with the program module PPG 204 as of status 09.01.1989.

Note:
Further diagnosis possibilities (actuator diagnosis etc), which would be feasible with newer program-module statuses, are not evaluated with these vehicles.

Pay attention to operating instructions for KTS 300. Connection of the KTS 300 to the diagnosis socket in the vehicle is via the adapter lead 1 684 463 196 (BMW).

If it is not possible to establish communication with the control unit, detach adapter lead at diagnosis plug. With ignition switched on, briefly connect term. 15 and term. 19 of diagnosis plug to commercially available test lead and test prods (connect stimulation lead to ground). Reconnect adapter lead.

- * As an alternative to the KTS 300, the self-diagnosis can be read out by way of a flashing code (not possible with all control units).
- * Stimulate flashing code with throttle position sensor following completion of lamp test (5 x fully depressed accelerator pedal in a time period of 5 seconds with ignition switched on). The flashing-code output starts with a longer individual flashing pulse to be followed by a pause of the same length. The actual code output then takes place. Stimulation is required after each individual flashing-code output.
- * The FGR (FGR = cruise control) operating unit is permanently recognized as being defective in the case of vehicles without cruise control.
- * The control-unit terminal designations used in these trouble-shooting instructions do not coincide with those in the stated basic instructions. The same applies to the test-step numbering.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults. For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

SAFETY AND PRECAUTIONARY MEASURES

Pay attention to information given in basic instructions, so as not to endanger persons and so as to avoid damaging engine, trigger boxes and control units.

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

1. Diagnosis lamp
2. Starting motor operates, engine fails to start or starts only with difficulty (warm and cold)
3. Engine hunts when idling
4. Harsh idling with warm engine
5. High fuel consumption in conjunction with inadequate engine output and formation of smoke
6. Unsatisfactory performance
7. Black fumes in full-load range in conjunction with hard engine running; possible loss of power
8. Hard engine running

								Cause (component fault)
*	*	*	*	*	*	*	*	Self-diagnosis
	*							Voltage supply, control units
	*							Injected-quantity adjuster
	*							Control-collar travel sensor
	*							Electric shutoff device (ELAB)
	*			*		*		Computer monitoring
				*		*		Solenoid-operated valve, start of injection
						*		Electropneumatic switching valve (EGR)
				*				Nozzle-holder assembly with needle-motion sensor (NBF)
				*				Interface
				*				Computer communication
				*		*		Engine-speed sensor
*								Engine-speed sensor and NBF
*		*		*				Tank empty, tank ventilation
*		*			*			Injection sequence not firing sequence

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

1. Diagnosis lamp
2. Starting motor operates, engine fails to start or starts only with difficulty (warm and cold)
3. Engine hunts when idling
4. Harsh idling with warm engine
5. High fuel consumption in conjunction with inadequate engine output and formation of smoke
6. Unsatisfactory performance
7. Black fumes in full-load range in conjunction with hard engine running; possible loss of power
8. Hard engine running

									Cause (component fault)
*	*	*	*	*	*	*	*	*	Self-diagnosis
			*						Inlet-union screw (fuel return line)
	*		*						Air in fuel system
	*								Paraffin separation
	*			*					Leakage in fuel lines
	*								Supply lines clogged
	*		*	*		*	*		Injection nozzle
	*		*	*		*			Pump/engine assignment
	*								Fuel filter
	*								Glow plug system
	*		*	*					Engine compression
			*		*				Engine air filter
	*		*	*	*				Engine management
					*	*			Timing device
	*								Fuel heating
					*				EGR valve

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

- 9. Diagnosis lamp
- 10. Engine missing when driving
- 11. Engine cuts out automatically
- 12. Engine runs at constant speed
- 13. Engine doesn't run up when cold
- 14. High idle or rough engine running at high speed
- 15. Black fumes in full-load range
- 16. Cloud of fumes in full-load range

Cause (component fault)

*	*	*	*	*	*	*	Self-diagnosis
		*					Pedal-position sensor and brake/brake safety switch
		*					Injected-quantity adjuster
		*					Control-collar travel sensor
		*					Computer monitoring
		*					Engine-speed sensor and needle-motion sensor
*	*		*			*	Tank empty, tank ventilation
			*			*	Injection sequence not firing sequence
*			*			*	Inlet-union screw, fuel return line
*			*			*	Air in fuel system
			*				Paraffin separation
*							Leakage in fuel lines
*			*			*	Supply lines clogged

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

9. Diagnosis lamp
10. Engine missing when driving
11. Engine cuts out automatically
12. Engine runs at constant speed
13. Engine doesn't run up when cold
14. High idle or rough engine running at high speed
15. Black fumes in full-load range
16. Cloud of fumes in full-load range

Cause (component fault)

*	*	*	*	*	*	*	Self-diagnosis
			*			*	Pump/engine assignment
			*			*	Fuel filter
			*				Engine compression
		*					Safety switch, pedal-position sensor
*							Fuel heating
*							Electric shutoff device (ELAB)
			*				Engine-speed sensor

TROUBLE-SHOOTING CHART (continued)

Customer complaint (fault symptoms)

17. Diagnosis lamp

18. High idle

19. No road-speed control (FGR) operation possible

20 No EGR function

21. No idle speed increase

Cause (component fault)

*	*	*	*	*		Self-diagnosis
			*			Computer monitoring
			*			Solenoid-operated valve, start of injection
			*			Electropneumatic switching valve (EGR)
			*			Nozzle-holder assembly with needle-motion sensor
	*		*			Engine-speed sensor
	*		*			Speed-signal sensor
		*				Switch, coupling or transmission neutral switch and/or brake/brake safety switch
			*			Air temperature sensor
			*			Engine temperature sensor
				*		A/C switch
		*				Operating element, road-speed control
		*				Interface Engine-speed signal
		*				Electropneumatic switching valve (automatic, RSC)

TEST SPECIFICATIONS

Component/function

Set values

Idle speed (engine at norm. op. temp., approx. 80° C):

	Vehicle at stand- still	Road speed (>2 km/h)
Manual trans.	705 min -1	770 min -1
Automatic trans.	705 min -1	770 min -1
Air-cond. control switched on	800 min -1	800 min -1
Engine cold		705...1090 min -1

Nozzle-opening pressure: 150 + 8 bar

Coordination, pump - engine (inj. timing):

Setting:

```
* Engine position:      Cylinder 1 at TDC
* Pump position:       1.05 mm after BDC
```

Check value:

```
* Engine position: Cylinder 1 at TDC
* Pump position: 1.03 - 1.07 mm after BDC
```

Compression: 25...30 bar

Max. diff. between cylinders: 5 bar

Filter test, max. permissible differential pressure: 0.3 bar

Pressure drop: max. permissible 25 %

Vacuum, vacuum pump	>500 mbar
---------------------	-----------

Electropneum. switch-over valve 27...33 Ω

SELF-DIAGNOSIS TEST TABLE

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions/test conditions	Termi- nals	Set values
Temp. sensor Engine Op.circ./sh. to pos. Short to ground	3	7	Test temperature sensor and lead for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. Temperature sensor, resistance: at 20...40°C at approx. 80°C	13, 53	1,1...2,7 Ω 0,3...0,34 Ω
Speed-sig. sens. Incorrect/no signal	9	28	<u>Correct speed display:</u> engine plug term. 14-ground Test lead for open-circuit: engine plug term. 14-plug Instrument cluster term. 26 and engine plug term. 14-plug Control unit term. 29 <u>No speed display:</u> test speed-signal sensor. Test lead for open-circuit: speed-signal sensor - instrument cluster	29	> 1,0 V 9 pointer deflections/wheel revolution
Road-sp. cont. - Operating element Op.circ./sh. to pos. Short to ground	10	29	Switch through FGR operating element positions: neutral N, reactivate RA, set (accelerate) S(a), set (decelerate) S(d), off. Measure voltages at term. 1 and term. 4. Test leads for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. Road-speed control (road-speed cont.) = FGR	13,20	N: 3,18...3,69 V RA: 1,43...1,94 V S(a): 0,57...1,08 V S(d): 2,35...2,86 V Off: 3,96...4,47 V
Interface Comp. communication Faulty	11	13	Renew control unit.		

SELF-DIAGNOSIS TEST TABLE (continued)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions/test conditions	Termi- nals	Set values
Air-temp. sensor Op. circ./short to positive Short to ground	12	15	Test temperature sensor and lead for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. Temperature-sensor resistance: at 20...40°C at approx. 80°C	13, 52	1,1...2,7 Ω 0,3...0,34 Ω
Battery voltage too low	23	10	Perform test in accordance with basic instructions (check voltage supply).	15, 16, 17	
Eng.-speed sensor Op.circ/grnd short Signal error	129	5*	Test leads for open-circuit and short-circuit to ground. Resistance, engine-speed sensor at approx. 20°C: Connect MOT-Tester special input to plug, engine-speed sensor term. 1. MOT-Tester setting: 20 V, 100 ms. Test leads for open-circuit (op. circ.) and short-circuit to ground. Resistance, engine-speed sensor at approx. 20°C: Connect MOT-Tester special input to plug, engine-speed sensor term. 1. MOT-Tester setting: 20 V, 100 ms.	13, 47,	830...1360 Ω 830...1360 Ω
Fuel temperature sensor Op.circ./sh. to pos. Short to ground	130	16	Connect test adapter KDEP 1165, adapter leads KDEP 1165/300 and -/301. Test temperature sensor and leads for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. Temperature-sensor resistance at 15...30°C: at 50...70°C:	13, 35,	1200...4000 Ω 300...1200 Ω

* Serious fault, diagnosis lamp permanently lit

SELF-DIAGNOSIS TEST TABLE (continued)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions/test conditions	Termi- nals	Set values
Pedal-p. sens. Potentiometer Signal too high	132	6	<p>Pedal-position-sensor resistance term. 2 and term. 4 as well as term. 1 and term. 4.</p> <p>Accelerator pedal is in idle position.</p> <p>Test leads for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. <u>Observe installation instructions for pedal-position sensor.</u></p> <p>Voltage at pedal-position sensor term. 1 and term. 4.</p> <p>Move accelerator pedal from idle to full-throttle position;</p> <p>Idle position:</p> <p>Full-throttle position:</p> <p><u>Comparison not O.K.</u></p> <p>Connect multimeter (A) to plug, pedal-position sensor term. 1 and term. 4, multimeter (B) to plug, pedal-position sensor term. 4 and term. 5. Multimeter A: Multimeter B:</p> <p>Move accelerator pedal from idle and full-throttle position. Step response (B) must result at set value (A).</p> <p>Test lead for open-circuit.</p> <p><u>Dynamic pedal-position-sensor monitoring:</u></p> <p>No fault indication. High idle, however reaction to accelerator-pedal movement taken place.</p> <p>Eliminate stiffness in accelerator-pedal actuator, check installation position of pedal-position sensor.</p>	14, 33, 50	<p>800...1400 Ω</p> <p>800...4110 Ω</p> <p>0,23...0,50 V</p> <p>2,79...4,60 V</p> <p>0,56...1,0 V</p> <p>0...5,5 V</p>
Signal too low				25	
Comparison not O.K.					

SELF-DIAGNOSIS TEST TABLE (continued)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions/test conditions	Termi- nals	Set values
Con.-col.tvl.sen. Signal too high Signal too low	134	3	<p>Connect test adapter KDEP 1165, adapter leads KDEP 1165/300 and -/301. Test voltage supply, socket 2 (+) and socket 3.</p> <p>Measure resistance: sockets 2 and 3 as well as sockets 1 and 3</p> <p>Test leads for open-circuit (op. circ.), short-circuit to ground and short-circuit to positive.</p> <p>4 <u>Comparison not O.K.</u> Test prerequisites: engine-speed sensor, needle-motion sensor, computer communication interface O.K.</p> <p>Test leads for open-circuit (see above). Visually inspect injected-quantity adjuster (safety instructions must be heeded).</p>	14, 21, 39	<p>4.5...5.5 V</p> <p>1,0...3,0 k Ω 0,5...2,0 k Ω</p>
Flow actuator control circuit defective	136	30	<p>Test adapter KDEP 1165, adapter leads KDEP 1165/300 and -/301. Check contact resistance term. 4 and 7 - ground.</p> <p>Measure resistance, flow actuator, term. 4 and 7. Check for open circuit in lead, contact resistance term. 4 and term. 7</p>	1, 2, 15, 16, 17	0,4...0,7 Ω
Needle sensor Signal too high Signal too low	142	21*	<p>Measure resistance, needle sensor (approx. 20°...80°C) Check leads for open circuit (op. circ.), short to positive and short to ground.</p> <p>Check contact resistance, pins, needle sensor with respect to ground.</p>	5, 12	90...135 Ω

* Serious fault, diagnosis lamp continuously lit

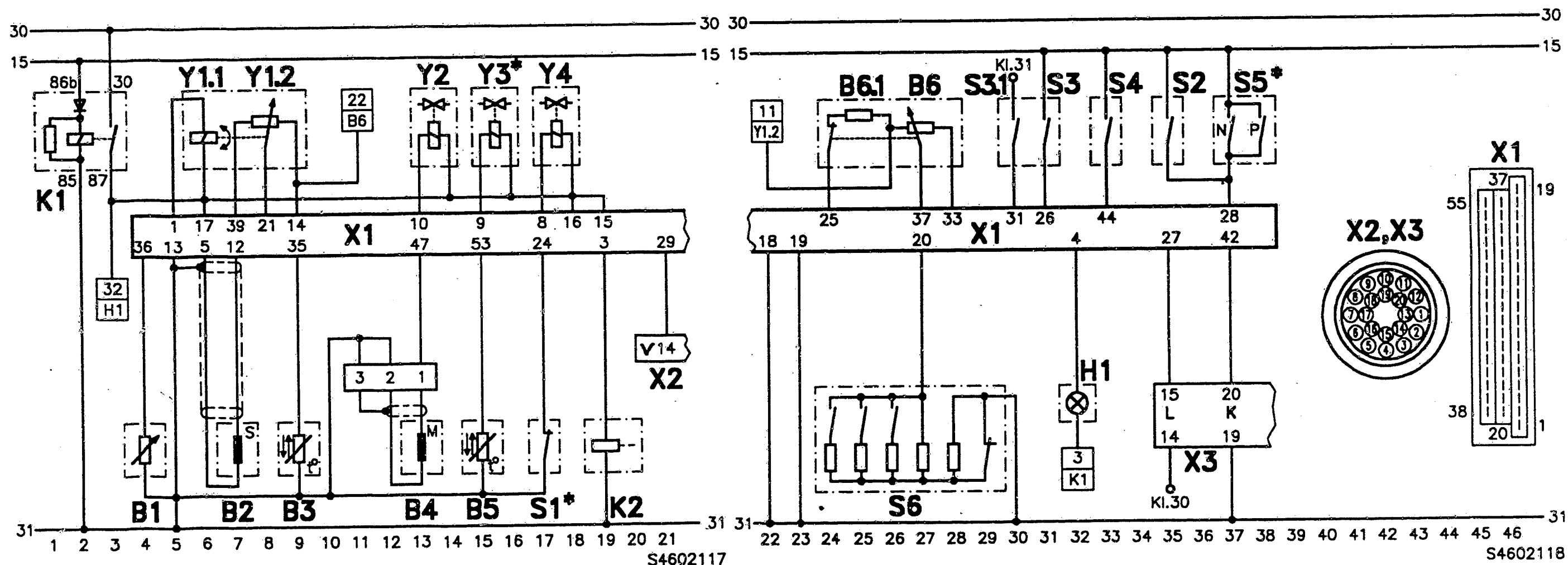
SELF-DIAGNOSIS TEST TABLE (continued)

Pocket system tester Fault indication	Fault code	Flash- ing code	Test instructions/test conditions	Termi- nals	Set values
Start of inj. Closed-loop control Faulty	144	19	Measure resistance, solenoid valve: Test solenoid valve and leads for open-circuit (op. circ.), short-circuit to positive and short-circuit to ground. Remove fuel-injection pump and test both supply pump pressure and timing-device profile.	10, 15	14,3...17,3 Ω
Brake/brake safety switch Comparison not O.K.	146	31	Brake/brake safety switch (br./br. safety switch) Connect a multimeter to each circuit, Press brake pedal several times. Step response: Test voltage supply: Test leads for open-circuit and contact resistance.	13, 26, 31	infinity Ω to approx. 0 Ω 11,5...14,5 V
Atmospheric pressure sensor Signal too high Signal too low	147	22	Establish atmospheric pressure. Control-unit version 3S1: actual value > desired value, fault "signal too high" detected. Actual value < desired value, no error message. If error message present, renew control unit. Control-unit version 3S2: if error message present, renew control unit.		1050 hPa
Electron. idle shut-off device defective	148	25*	Carry out testing in accordance with basic instructions (trouble-shooting program, electric shut-off device).		

* Serious fault, diagnosis lamp continuously lit

SELF-DIAGNOSIS TEST TABLE (continued)

CU output stages Short to B+	149	32	Resistance, solenoid valve (start of injection): Check for short to positive (B+):	10	14,3...17,3 Ω
			Resistance, electropneumatic switching valve (FGR for automatic transmission): Check for short to positive (B+):	9	27...33 Ω
			Resistance, electropneumatic switching valve (EGR) Check for short to positive (B+):	8	27...33 Ω
Water level display active/defective	150	27	Carry out testing in accordance with basic instructions (trouble-shooting program, water level display).		

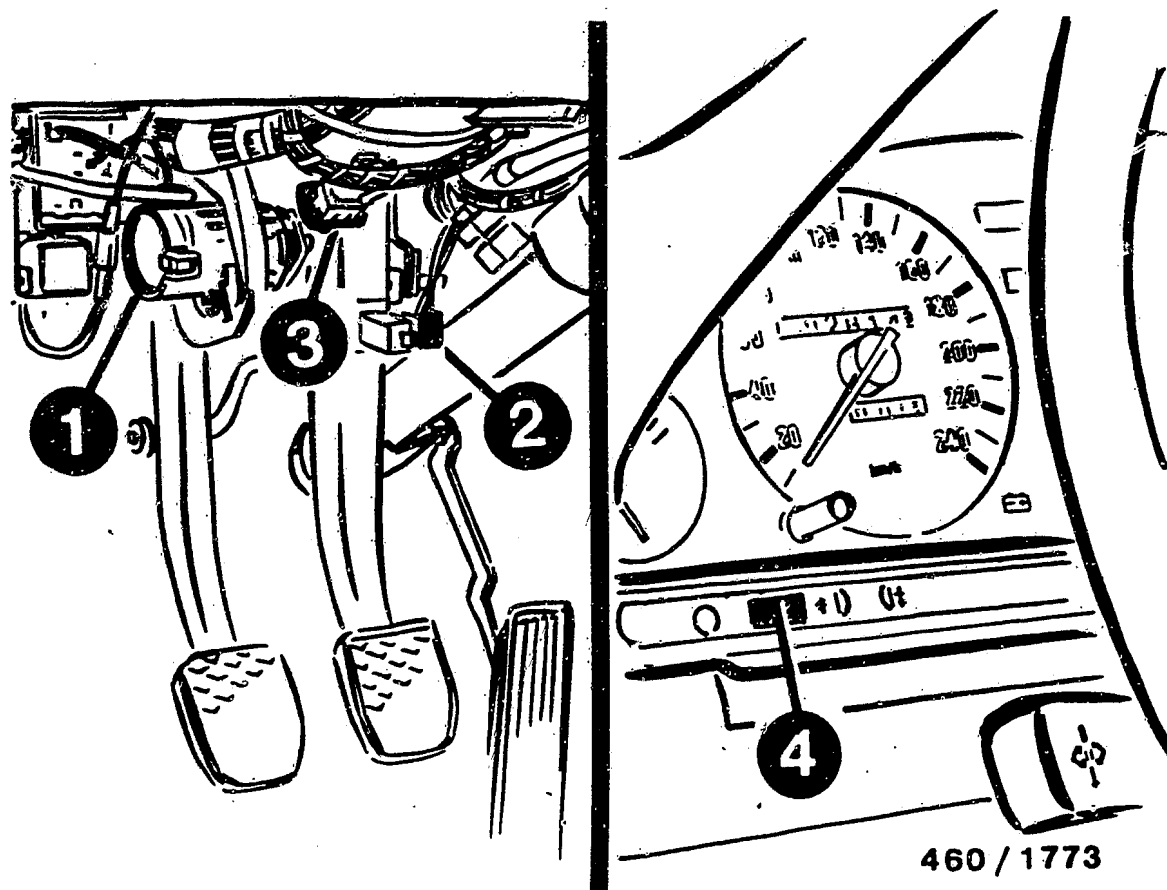


ELECTRICAL TERMINAL DIAGRAM

B1 = Water level sensor
 B2 = Needle movement sensor
 B3 = Temperature sensor (fuel)
 B4 = Engine-speed sensor
 B5 = Temperature sensor (coolant)
 B6 = Throttle position sensor
 B6.1=Idle switch
 H1 = Diagnosis lamp
 K1 = Reversed-polarity protection relay
 K2 = Electric shutoff device (ELAB)

S1*= Switch (transmission indicator)
 S2 = Switch (clutch)
 S3 = Switch (brake)
 S3.1=Switch (brake safety)
 S4 = Switch (A/C)
 S5*= Transmission neutral switch
 S6 = Cruise-control operating unit
 X1 = Control unit
 X2 = Engine plug

X3 = Diagnosis plug
 Y1.1=Injected-quantity adjuster
 Y1.2=Control-collar travel sensor
 Y2 = Solenoid valve (start of injection)
 Y3*= Electropneumatic switching valve
 Y4 = Electropneumatic switching valve (EGR)



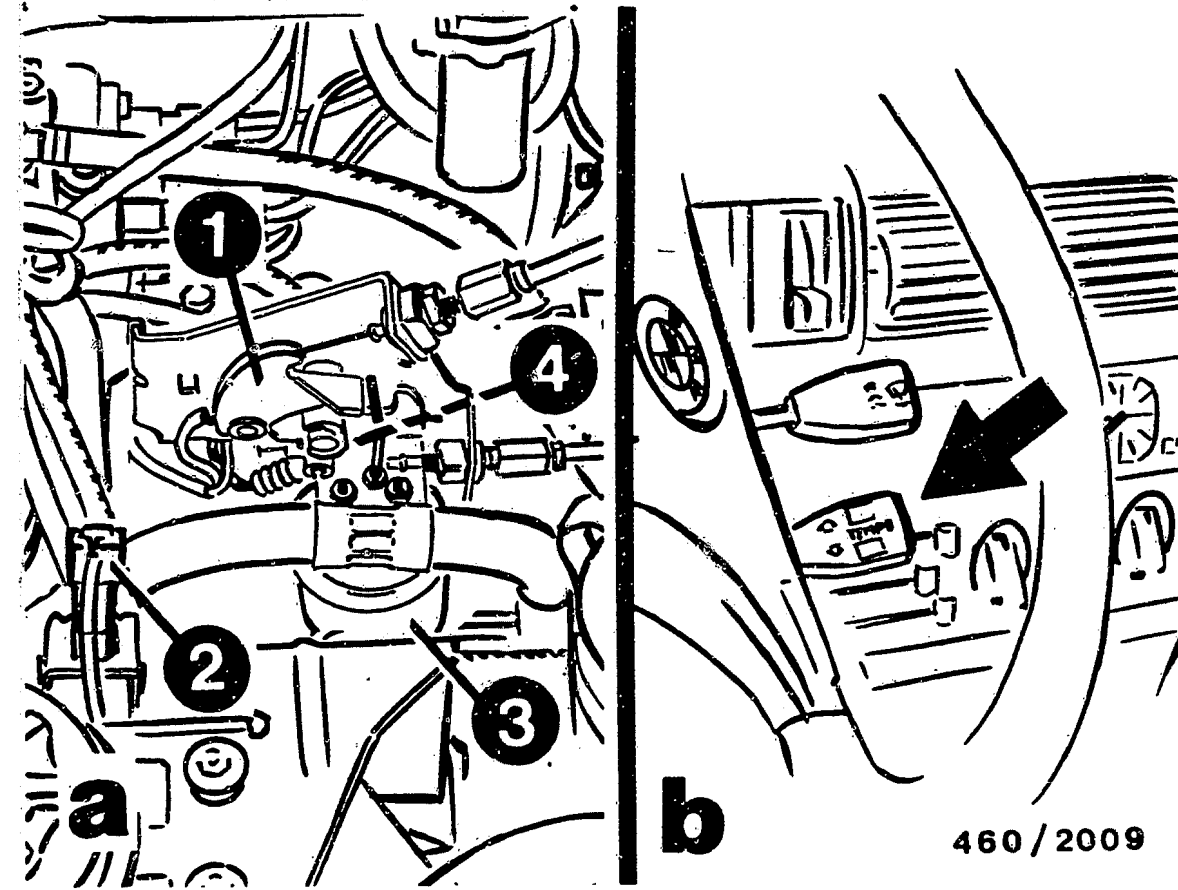
460 / 1773

- 1 = Throttle position sensor
- 2 = Switch (brake/brake safety)
- 3 = Switch (clutch)
- 4 = Diagnostic lamp (in connection with water-level sensor indicator)

INSTALLATION POSITION OF COMPONENTS

Road-speed sensor is built onto the differential housing.

Control unit is installed in the glove compartment.



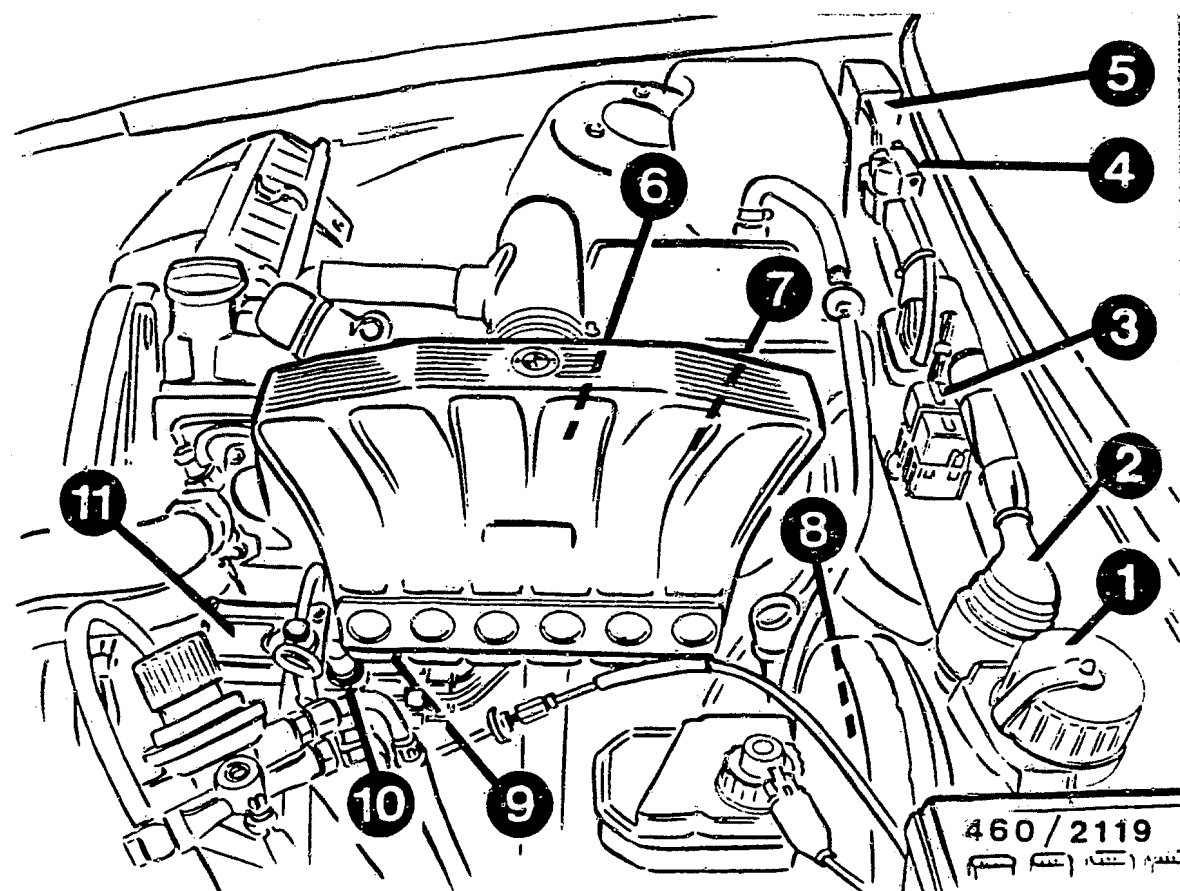
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Vehicles with automatic transmission (picture a)

- 1 = Automatic transmission control
- 2 = Electropneumatic switching valve (FGR)
- 3 = Control unit (FGR)
- 4 = Transmission indicator (not visible in picture)

The electropneumatic switching valve is installed in the transmission, whereas the transmission neutral switch is installed in the gear-shift console.

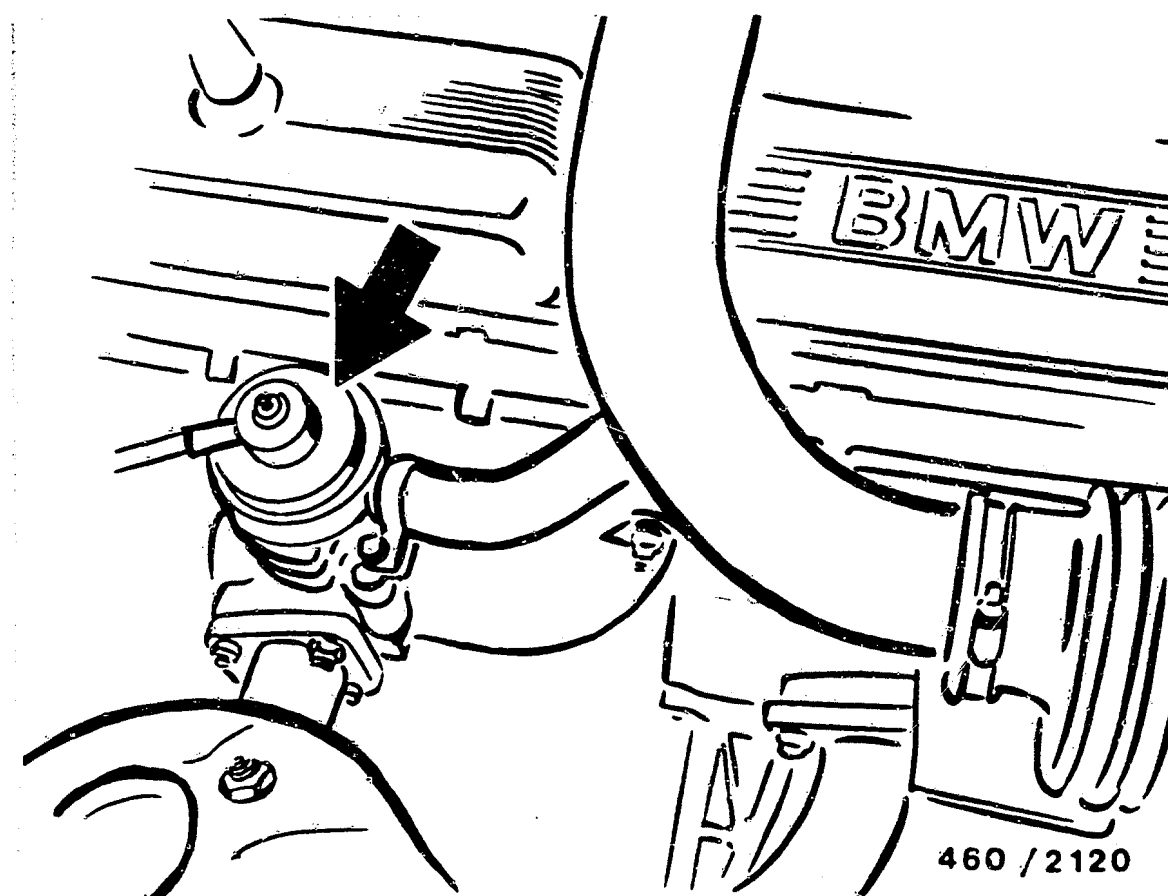
Cruise-control operating unit (picture b, arrow).



- 1 = Diagnosis plug
- 2 = Engine plug
- 3 = Reversed-polarity protection relay
- 4 = Electropneumatic switching valve (EGR)
- 5 = Glow-duration unit
- 6 = Nozzle-holder assembly with NBF (4 cyl.)
- 7 = Temperature sensor (coolant)
- 8 = Engine-speed sensor
- 9 = Temperature sensor (air)
- 10 = Electric shutoff device (ELAB)
- 11 = Fuel-injection pump

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Solenoid valve (start of injection) and temperature sensor (fuel) are installed in fuel-injection pump.



INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Arrow: EGR valve

TABLE OF CONTENTS

Trouble-shooting instructions: VWV-5003

BOSCH system : Ecotronic (4.0)

Make of vehicle : VWV

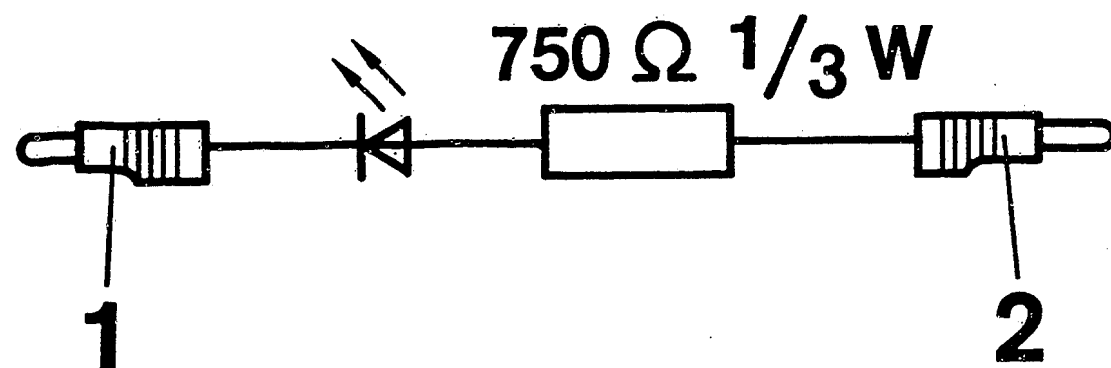
Basic microcard : KFZ-00..

Section	Coordinate
Special features, safety, usage.....	02
Trouble-shooting chart.....	05
Rapid diagnosis chart for universal test adapter.....	07
Test specifications.....	15
Electrical terminal diagram.....	17
Installation position of components.....	19

SPECIAL FEATURES

- * This microcard contains the Ecotronic (ECO 4.0) trouble-shooting instructions, valid at the time of publication; for the following VW models:

Golf 1,6 l, Jetta 1,6 l, Passat 1,6 l with manually shifted transmission (03.87 ->)
- * Ecotronic with lambda closed-loop control (ECO 4.0) with 25-pin control unit.
- * If a sensor fails, the control unit operates with specified substitute values.
- * The system is similar to the Ecotronic (ECO 3) in the Mercedes-Benz makes 190, 200; refer to SIS Index on Microcard KFZ-00..



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SPECIAL FEATURES (Continued)

In addition to the testers described in the basic instructions, the diagnosis evaluation unit KDAW 9980 or a test lead (self-fabricated) is required for adjusting the lambda closed-loop control range (see illustration).

1 = Connection for LED at unassigned lead in engine compartment
2 = Connection for U_B

STRUCTURE, USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to various causes/component faults. Detailed instructions for trouble-shooting must be taken from the basic instructions via the trouble-shooting chart.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Finding individual test steps in the brief and basic instructions is made easier through the use of identical test-step numbers.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to prevent damage to the engine, control unit or ignition system, be sure to observe the safety and precautionary measures in the basic instructions.

*** C A U T I O N !**
High-performance ignition system.
Dangerous primary and secondary voltages.

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

For further precautionary measures, see basic instructions.

TROUBLE-SHOOTING CHART

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas)
4. Poor throttle response, flat spot during acceleration
5. Engine misfiring (ignition, fuel induction)
6. Maximum engine power/top speed not reached
7. Fuel consumption too high
8. Engine running on (dieseling)
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp

Cause (component fault)											
*	*	*	*	*	*	*	*	*	*	*	Test with universal adapter
								*	*		Fuel not to DIN
*			*	*	*						Fuel pressure outside tolerance
	*		*	*							Fuel delivery outside tolerance
*	*	*	*	*	*	*					Choke-valve flap stiff
*	*		*	*							Float/float-needle valve
*	*	*	*	*	*						Dirt in carburetor
	*	*	*	*	*						Induction system leaking
	*	*									Intake-manifold heating
	*	*									Intake-air preheating
		*				*					Adjustment, throttle valve stage I
		*	*	*	*	*					Incorrect nozzle type
			*		*						Vacuum unit stage II
		*	*		*						Adjustment, throttle vlv. stage II
			*		*	*					Adjustment, accelerator actuation
		*	*								Throttle valve worn

TROUBLE-SHOOTING CHART (continued)

Customer complaint (symptoms of trouble)

1. Starting motor operates, but engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Rough idling (engine speed, exhaust gas)
4. Poor throttle response, flat spot during acceleration.
5. Engine misfiring (ignition, fuel induction)
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

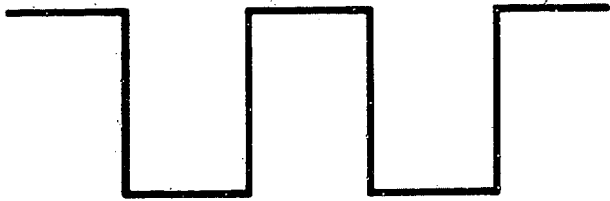
Cause (component fault)											
	*										Idle adjustment
	*	*	*								Bypass heating defective
	*	*	*	*	*						Exhaust-gas system defective
	*	*	*	*	*						Lambda sensor defective
	*	*	*	*	*	*	*	*	*		Test ignition system
		*	*								Release/forced return, stage II.

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01
 Adapter lead: 1 684 463 182

Test step	Switch V	Ω	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values
1	 V	1	Choke-valve actuator, insulation resistance	Make bridge, socket 1/socket 2 to universal test adapter. Ignition switched off, control unit not connected.	12 2	Greater than 1M Ω
1.1	 V	2	Intake-manifold heating relay, winding resistance		14 2	Less than 100 Ω
2	 V	3	Choke-valve actuator winding resistance		12 10	Less than 10 Ω
3	 V	9	Coolant-temperature sensor	Set value is temperature-dependent: at + 20°C: at + 80°C:	21 7 21 7	2...3 k Ω 280...360 Ω
3.1	 V	10	Intake-manifold temperature sensor	Set value is temperature-dependent: at + 20°C: at + 80°C:	5 7 5 7	2...3 k Ω 280...360 Ω
4	 V	7	Ground cables, resistance		20 2	Less than 10 Ω
4.1	 V	12	Solenoid-operated valve, evacuating, in throttle-valve actuator, insulation resistance		9 2	Greater than 1 M Ω
4.2	 V	13	Solenoid-operated valve, ventilating, in throttle-valve actuator, insulation resistance		3 2	Greater than 1M Ω
5	 V	17	Solenoid-operated valve, evacuating, in throttle-valve actuator, winding resistance		9 23	20...80 Ω
6	 V	18	Solenoid-operated valve, ventilating, in throttle-valve actuator, winding resistance		3 23	20...80 Ω
8	 V	20	Resistance, potentiometers, throttle-valve actuator and throttle valve	Potentiometers are connected in parallel	18 7	0,7...1,3 k Ω

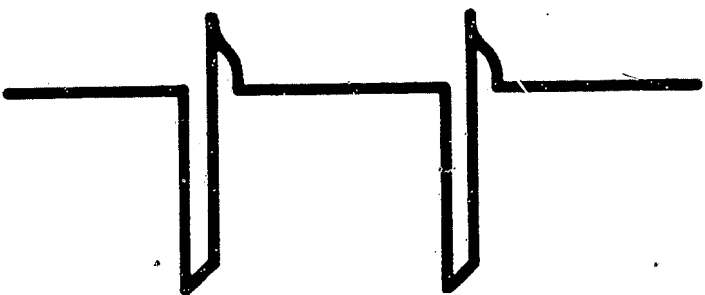
RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 Continued
Adapter lead: 1 684 463 182

Test step	Switch V	Ω	Testing of component/function Test instructions/conditions	Termi- nals	Set values
10	3	20	Supply voltage, control unit (Control unit connected)	1 2	Greater than 10 V
10.1	4	20	Switch on ignition. Voltage supply of solenoid-operated valves in throttle-valve actuator.	23 2	Greater than 10 V
11	5	20	Connect ignition oscilloscope with black clip to black measuring recess and with red clip to red measuring recess of universal test adapter. Engine is running and at normal operating temperature. Measurement of engine-speed signal and pulses during starting procedure.	25 2	See upper illustration
12	6	20	Voltage supply term.15	13 2	Greater than 10 V
13	7	20	Supply voltage for potentiometers (throttle valve and throttle-valve actuator)	18 2	4,5...5,5 V
14	8	20	Voltage supply, hedgehog-heating relay in intake manifold	14 2	Greater than 10 V
16	10	20	Test throttle-valve actuator: remove bridge socket 1/socket 2 at universal test adapter. Press push-button T3 at universal test adapter. Rod of throttle-valve actuator moves into overrun position. Engine dies. Value may change a max. of 0,2 V within 30 seconds.	17 2	0,1...0,8 V ↓ V After approx. 30 s. + max. 0,2 V

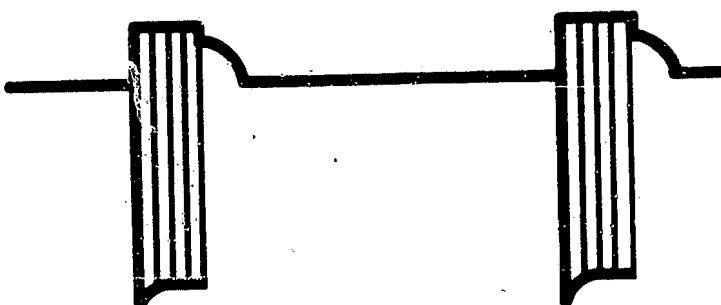


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Test step	Switch		Testing of component/function Test instructions/conditions	Termi- nals	Set values
	V	Ω			
17	11	20	Test throttle-valve potentiometer: slowly push accelerator pedal to floor. Voltage value increases continuously between min. and max. .	11 2 11 2	Min: 0,05...0,6 V Max: 4,2...5,5 V
18	10	20	Test throttle-valve actuator (ventilating side): Apply lead from socket 2 at universal test adapter 1 s. to ground (e.g. black measuring recess). <u>Attention:</u> under no circumstances allow socket 1 at universal test adapter to make contact with positive (e.g. red measuring recess)	17 2	0,3...1,0 V After 1 s. V 2,8...4,2 V
19	12	20	Measurement of signal for choke-valve actuator: Make bridge socket 1/socket 2 at universal test adapter. Start engine.	12 2	See upper illustration
20	12	20	As 19, however, signal becomes wider when push-button T5 at universal test adapter is pressed (simulation, cold engine)	12 2	See lower illustration
21	12	20	Acceleration enrichment: Briefly actuate accelerator pedal. Signal becomes wider.	12 2	See lower illustration
23	13	20	Actuation of ventilating valve in throttle-valve actuator: Switch off ignition. Then pay attention to time and voltage value!	3 2 3 2	Greater than 10 V after approx. 5...20 s Less than 1 V



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RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 Continued

Adapter lead: 1 684 463 182

Test step	Switch V	Ω	Testing of component/function Test instructions/conditions	Termi- nals	Set values
24	14	20	Start engine. Actuation of evacuating valve in throttle-valve actuator: Switch on ignition. Then pay attention to time and voltage value!	9 2 9 2 9 2	Less than 1 V after approx. 12 s Greater than 10 V after further approx. 3 s Less than 1 V
26	23	20	Lambda closed-loop control, open-loop control value at test output. Connect KDAW 9980 or test lead with LED to unassigned lead in engine compartment. Engine runs and has normal operating temperature	6 2	LED flashes at high frequency
27	23	22	Lambda closed-loop control, rich value at test output	6 2	LED goes out
28	23	23	Lambda closed-loop control, lean value at test output	6 2	LED lights up
29	23	24	Lambda closed-loop control, closed-loop control value at test output	6 2	LED flashes at approx. 2 Hz
29.1	18	20	Transmission identification Vehicles with manually shifted transmission: Vehicles with automatic transmission:	16 2 16 2	Approx. 0...5 V Greater than 6 V
31	—	—	Test CO value. Connect CO analyzer to exhaust-sample pipe in front of the catalytic converter. (Hose for crankshaft ventilation disconnected; lead to lambda sensor disconnected).	—	0,2...1,0 % CO by vol.

TEST SPECIFICATIONS:

Idle speed: 900 ± 75 min⁻¹

Adjust lambda closed-loop-control range:

Run engine to warm up until at normal operating temperature (approx. 80°C). Increase engine speed for 30 s. to greater than 2000 min⁻¹, so that the lambda sensor is sure to be at normal operating temperature. Afterwards, immediately connect KDAW 9980 or test lead to unassigned lead in engine compartment and to battery term.30. Run engine at idle. LED of test lead must flash at approx. 1,5 Hz. If necessary, adjust at idle mixture-adjusting screw.

Exhaust-gas adjustment:

Test CO value with engine at normal operating temperature (in vehicles with lambda closed-loop control, test at sampling pipe before catalytic converter): 0,2...1,0 %CO by vol.

Fuel pressure: 0,1...0,3 bar

Minimum fuel delivery
(at 2000 min⁻¹) 1 l/min

Float weight: 7,9 ± 0,5 g
Float height: 27,5 ± 1,0 mm
(Float cannot be adjusted)

Throttle-valve potentiometer

Total resistance: 1,4...2,6 k Ω
Wiper resistance in
correcting range: min. less than 270 Ω
max. 1,4...2,4 k Ω

Choke-valve actuator:

Winding resistance: 0,9...1,7 Ω

Basic setting, throttle
valve

Stage I (with feeler gauge) 3,15 ± 0,1 mm
Stage II a = 0,03 ± 0,02 mm

TEST SPECIFICATIONS (continued):

Release and forced return

Stage II: Y = 1,0 ± 0,2 mm
Z = 0,4 ± 0,2 mm

Winding resistance, intake- manifold heating relay:

20...50 Ω

Throttle-valve actuator

Evacuating valve (term.1/term.2): 20...70 Ω
Ventilating valve (term.6/term.7): 20...70 Ω
Total resistance, potentiometer
(term.3/term.4): 1,4...2,6 k Ω
Wiper resistance in correcting
range (term.5/term.3): min. less than 400 Ω
max. 1,4...2,4 k Ω

Temperature sensor (NTC):

Internal resistance at 20°C: 2,0...3,0 k Ω
at 80°C: 280...360 Ω

Heating element, intake-manifold heating:

Internal resistance at 20°C: approx. 1,5 Ω

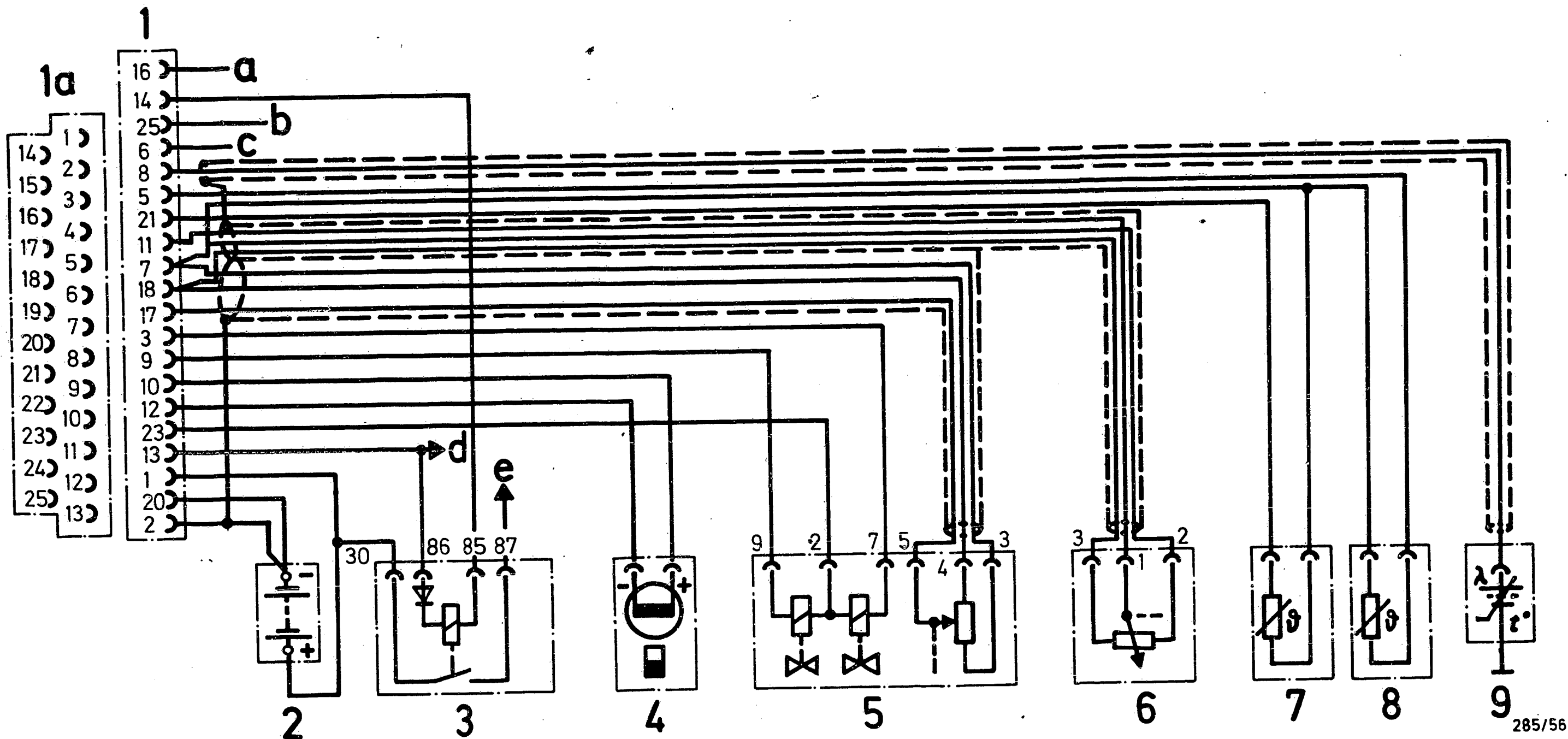
Type of nozzle:

	Stage 1	Stage 2
Main nozzle	x 105	x 110
Idle fuel nozzle	x 45	
Acceleration fuel nozzle		90
Air correction nozzle (with mixing tube)	x 110	x 105
Acceleration air nozzle		x 130
Full-load enrichment		100±10

Tightening torques

Carburetor mounting 7 Nm
Flange mounting 13 Nm

See equipment and Autodata microcards for
setting values for valve clearance and
other engine-related data.



Electrical terminal diagram of the Ecotronic

1 = Control unit, Ecotronic

1a = Plug assignment

2 = Battery

3 = Relay, intake-manifold heating

4 = Choke-valve actuator

5 = Throttle-valve actuator (DKA)

6 = Potentiometer, main throttle valve

7 = Coolant-temperature sensor

8 = Intake-manifold temp. sensor

9 = Lambda sensor

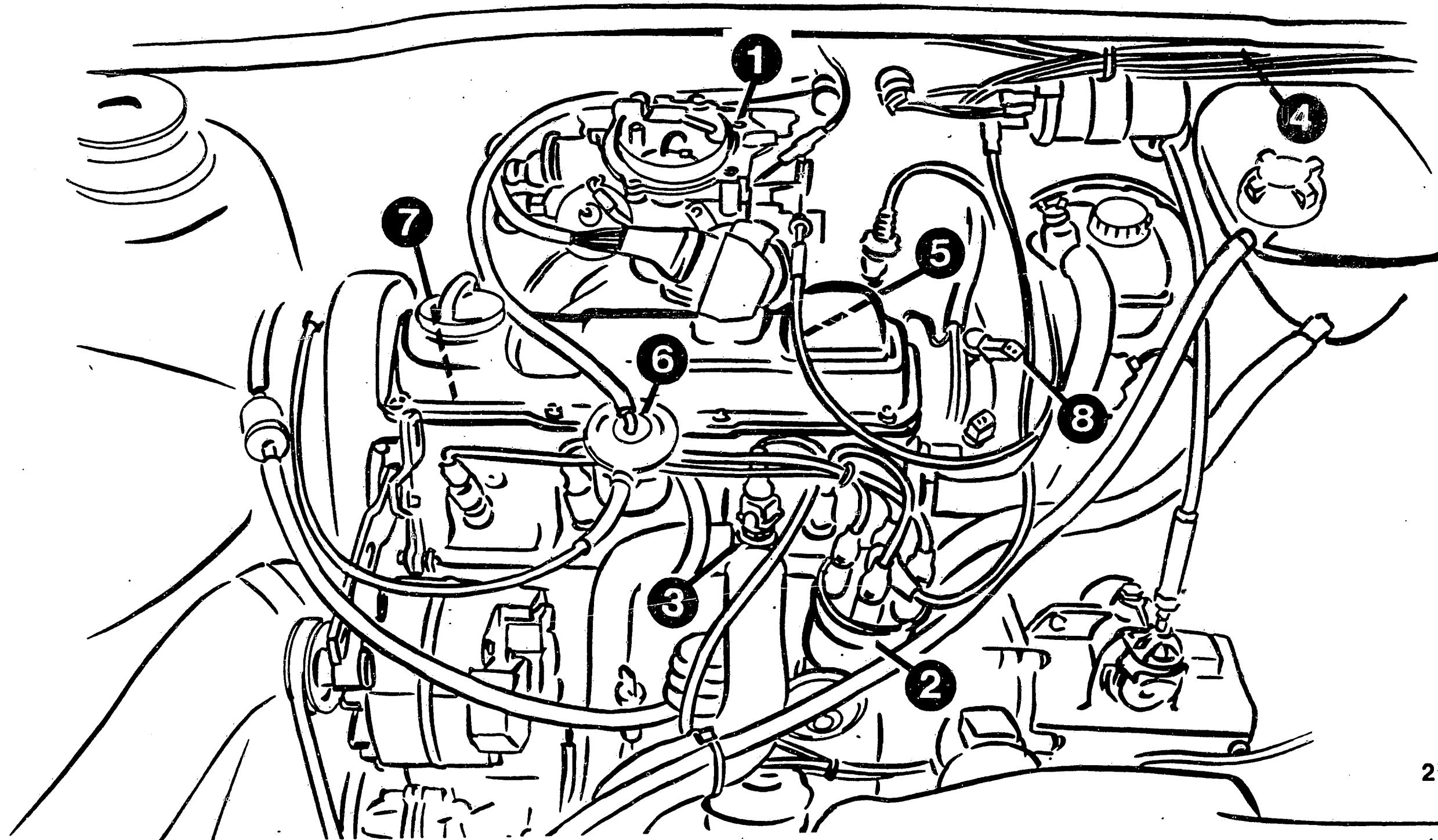
a = Transmission identification

b = Td Signal

c = Unassigned lead for setting the control range of the lambda sensor

d = Term. 15

e = To heating element, intake-manifold heating



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Installation position of components

- | | | |
|-----------------------------------|--|---|
| 1 = Carburetor | 4 = Control unit, Ecotronic
(beneath cover) | 7 = Sampling pipe for CO measurement |
| 2 = Ignition distributor | 5 = Intake-manifold temp. sensor | 8 = Unassigned lead for adjustment of
control range of lambda sensor |
| 3 = Coolant-temperature
sensor | 6 = Vapor-bubble separator | Lambda sensor is installed in exhaust manifold |

Note: Installation position in Passat identical; engine is installed longitudinally.

Trouble-shooting instructions : SAA-5003
BOSCH system : TZ-H
Make of vehicle : SAAB
Basic microcard : KFZ-00.

TABLE OF CONTENTS

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Rapid diagnosis chart.....	07
Test specifications.....	15
Electrical terminal diagram.....	17
Installation position of components, removal and installation instructions.....	19

SPECIAL FEATURES

These brief instructions, valid at the time of publication, apply to the following Saab models:

SAAB 900 Turbo 16 8.84 ->
Engine 2.0 l 4 cyl.

SAAB 9000 Turbo 16 9.84 ->
Engine 2.0 l 4 cyl.

- * Trigger box 0 227 100 118, ...139, ...147
(with current limitation)
 - * Ignition coil 0 221 122 327
 - * Ignition distributor with no centrifugal advance, however with double-acting vacuum unit for intake pressure and charge-air pressure.
 - * Ignition-pulse booster (non-Bosch) for actuation of systems dependent on ignition pulses.
Only vehicles from model years 86 and 87.
- For vehicles prior to model year 86, systems dependent on ignition pulses are actuated via the ignition coil term. 1.
- * Knock control APC. (non-Bosch system)
acts on charge-air pressure.

STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!

High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

TROUBLE-SHOOTING CHART

Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on.
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)									
*			*						H.T. side
*									Firing order
*			*						Ignition coil
*									Ignition-distributor as-installed setting
*									Voltage, trigger box
*									Voltage, primary circuit
*									Ignition-distributor plug and socket
*									Voltage supply, magnetic pulse generator
*									Magnetic-pulse-generator function
*									Contact resistance (primary side)
*									Primary signal
*									Ignition-pulse booster (signal check)

TROUBLE-SHOOTING CHART (CONTINUED)

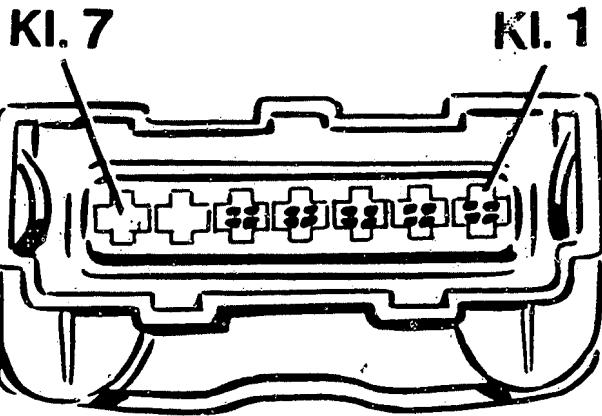
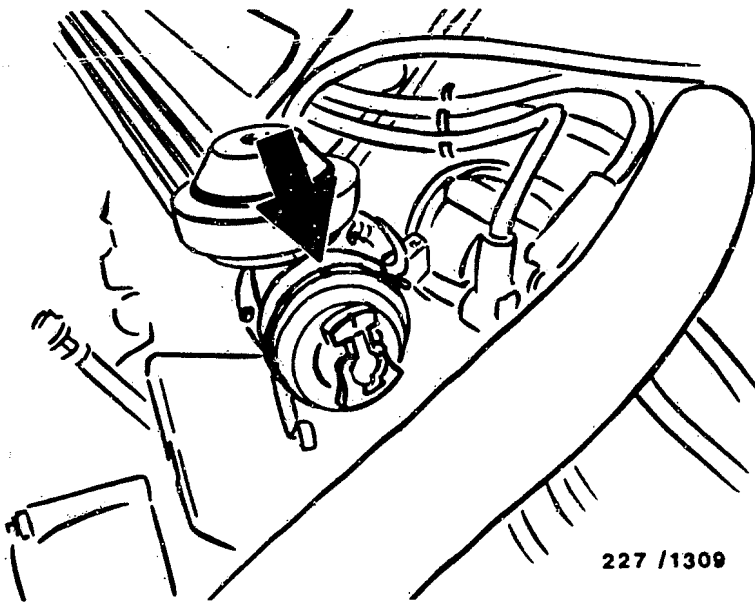
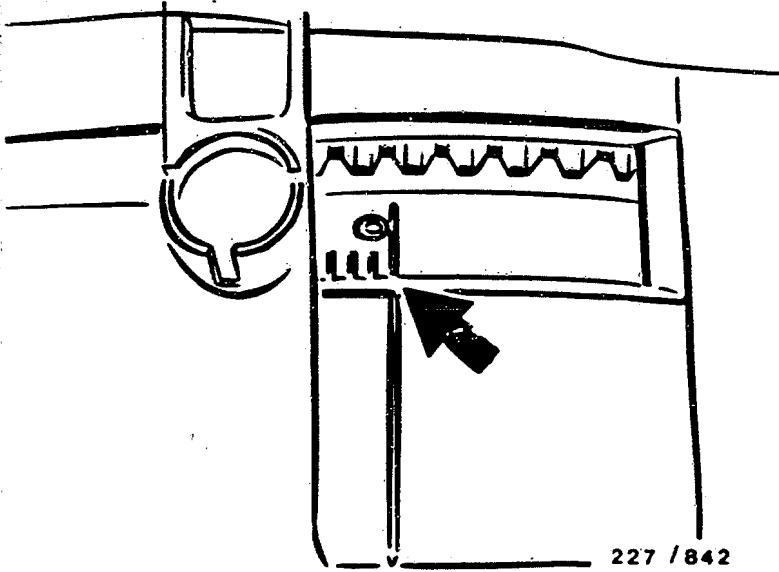
Customer complaint (fault symptoms)

- Starting motor operates, engine fails to start or starts only with difficulty.
- Engine starts but then dies.
- Idle problems (engine speed, exhaust gas).
- Poor throttle take-up, flat spot during acceleration.
- Engine missing (ignition, injection).
- Maximum engine power/top speed not reached.
- Fuel consumption too high.
- Engine running on (dieseling).
- Engine pinging/knocking.
- Engine overheating.
- Fault lamp.

Cause (component fault)									
*	*	*		*	*		*	*	Ignition point and ignition timing
			*						Voltage, trigger box (engine idling)
			*						Voltage, ignition coil (engine idling)
*									Peak-coil-current cutoff
			*						Primary voltage (engine idling)

RAPID DIAGNOSIS CHART

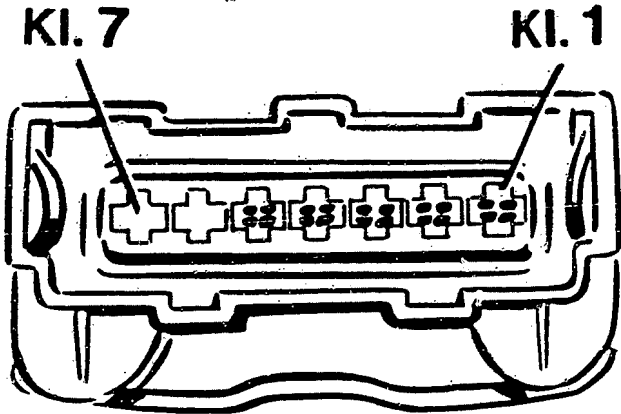
Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
1	H.T. SIDE Check function of spark plugs, ignition harness and distributor cap etc. (e.g. open circuit, shunt). Assess for example by way of ignition oscillogram, resistance measurement, visual inspection.	—	—
2	FIRING ORDER Check firing order and correct if necessary.	—	—
3	IGNITION COIL Visual check: plug present, sealing compound oozed out? Resistance, primary Resistance, secondary	<div>1 15</div> <div>1 4</div>	<div>0,6... 1,0 Ω</div> <div>6,4...11,1 k Ω</div>
4	IGNITION-DISTRIBUTOR AS-INSTALLED SETTING Set cylinder 1 in compression stroke to TDC, distributor rotor points to mark on distributor housing.	—	<div>(Top picture)</div> <div>(Center picture)</div>
5	VOLTAGE, TRIGGER BOX Detach trigger-box plug. Voltage, trigger-box plug. See bottom picture. Ignition ON.	<div>4 2</div> <div>(+) (-)</div>	Battery voltage.



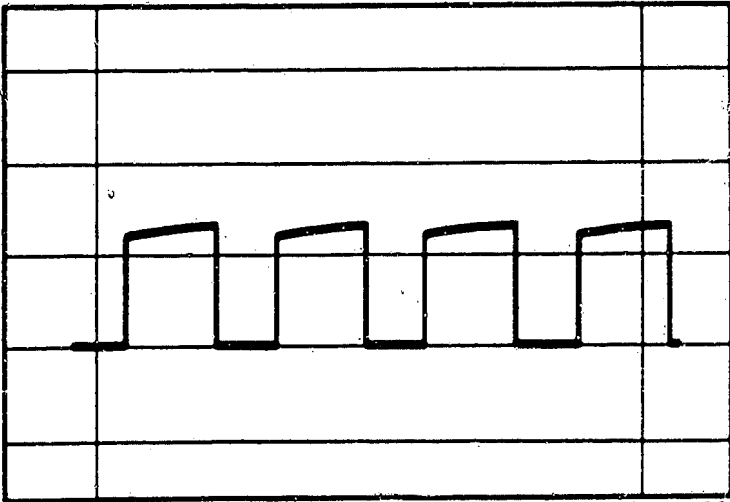
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
6	VOLTAGE, PRIMARY CIRCUIT Trigger-box plug detached. Voltage, trigger-box plug. See top picture. Ignition ON.	1 (+) 2 (-)	Battery voltage
7	IGNITION-DISTRIBUTOR PLUG AND SOCKET Visual inspection: Check plug and socket for oxidation.	—	—
8	VOLTAGE SUPPLY, MAGNETIC PULSE GENERATOR Ignition-distributor plug connected. Voltage, ignition-distributor plug. Ignition ON.	3 (-) 5 (+)	Equal to/greater than 10 V
9	MAGNETIC-PULSE-GENERATOR FUNCTION Connect oscilloscope "Special" to ignition-distributor plug and vehicle ground. Actuate starting motor.	6 B- (+) (-)	Rectangular pulse (bottom picture)



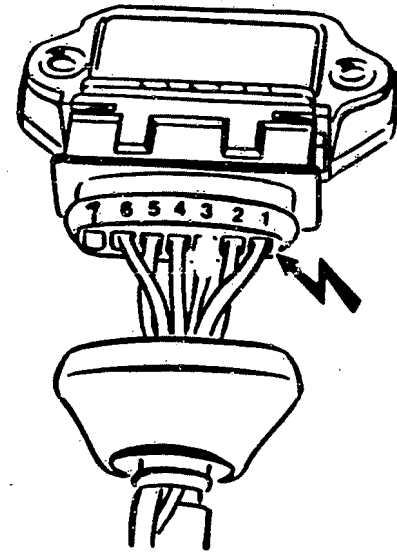
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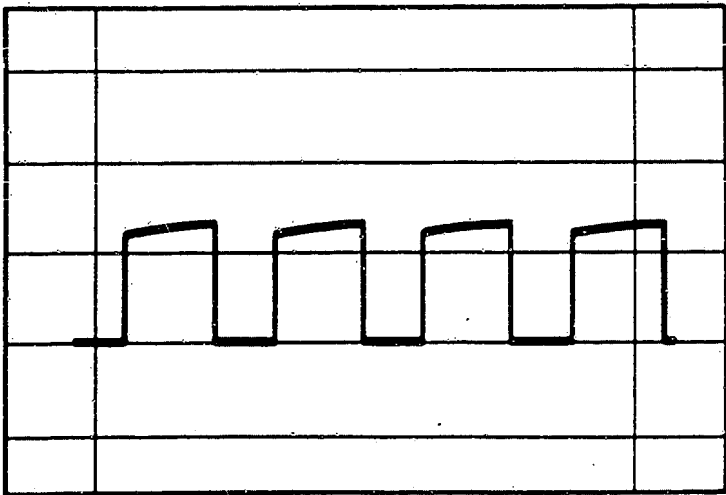
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
10	CONTACT RESISTANCE (primary side) Detach negative and positive lead from battery. Trigger-box plug detached. Ignition ON. Resistance between battery terminal and trigger-box plug. Resistance between battery terminal and ignition coil. Resistance between ignition coil and trigger- box plug.	 B+ 4 B- 2 B+ 15 1 1	 max. 0.3 Ω max. 0.3 Ω
11	PRIMARY SIGNAL Attach trigger-box plug. Oscilloscope/engine-speed tester to ignition coil. Actuate starting motor.	 15 1 (+) (-)	 Primary voltage/eng. speed reading (mag- nitude irrelevant)
12	IGNITION-PULSE BOOSTER (SIGNAL CHECK) Connect oscilloscope "Special" to ignition test connection and vehicle ground. Actuate starting motor.	 5 B- (+) (-)	 Rectangular pulse (bottom picture)
13	IGNITION POINT AND IGNITION TIMING Connect up engine tester as per operating instructions.	 —	 See test specifica- tions (e.g. Autodata)



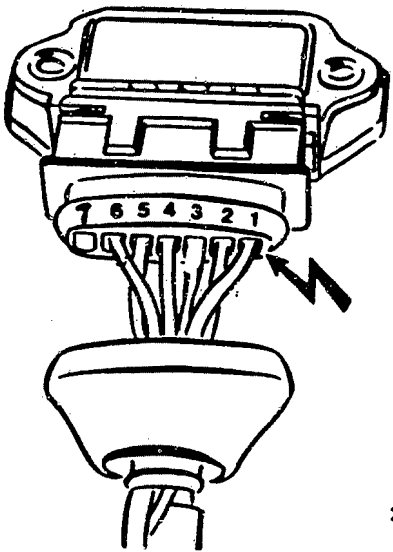
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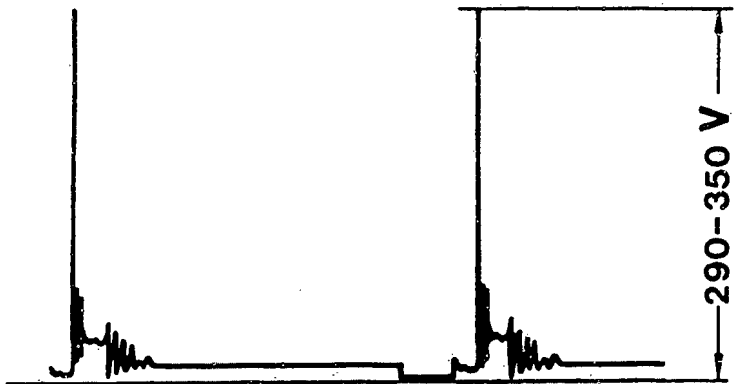
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RAPID DIAGNOSIS CHART (CONTINUED)

Test step	Testing of component/function Test instructions/conditions	Termi- nals	Set values
14	VOLTAGE, TRIGGER BOX Push back rubber sleeve of trigger-box plug. Voltage, trigger-box plug. See top picture. Engine idling.	4 2 (+) (-)	12-14 V Max. 1 V less than U _B
15	VOLTAGE, IGNITION COIL Voltage, ignition coil and battery. Engine idling.	15 B- (+) (-)	Equal to/greater than 10 V
16	PEAK-COIL-CURRENT CUTOFF Voltage, ignition coil. Ignition ON.	15 1 (+) (-)	After approx. 1 s 0 V.
17	PRIMARY VOLTAGE Oscilloscope with pulse-shaping circuit to ignition coil. Engine idling See bottom picture	15 1 (+) (-)	290...350 V



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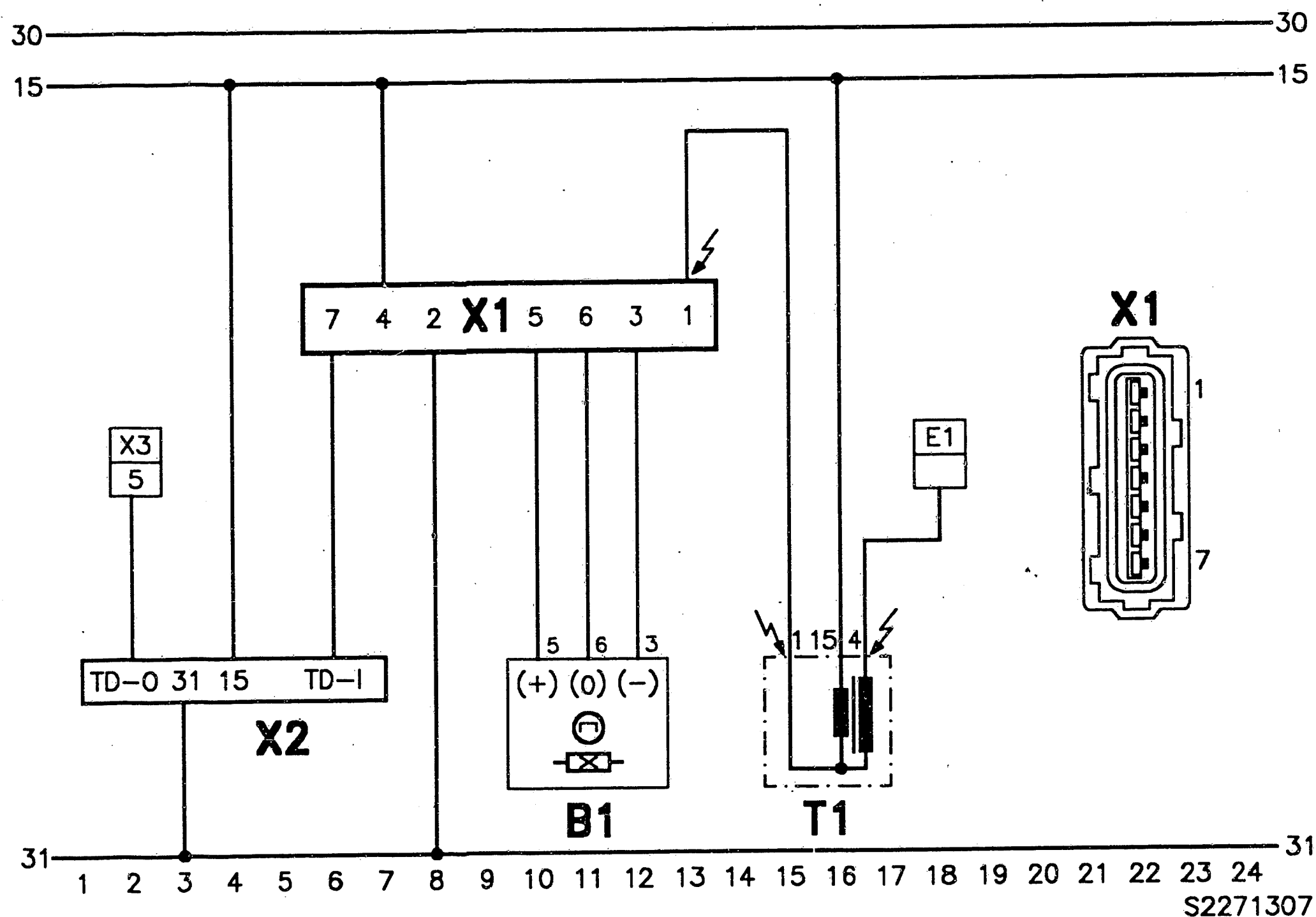


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TEST SPECIFICATIONS

Ignition coil, primary	0,6... 1,0 Ω
Ignition coil, secondary	6,4...11,1 k Ω
Voltage, trigger box with ignition ON	Battery voltage
Voltage, primary circuit with ignition ON	Battery voltage
Voltage supply, magnetic pulse generator with ignition ON	equal to/greater than 10 V
Magnetic pulse generator function at cranking speed	Rectangular pulse
Contact resistance Supply leads Trigger box/ Primary circuit	Max. 0.3 Ω
Primary signal at cranking speed	Primary voltage/ engine speed reading
Ignition point and ignition timing	Test specifications e.g. Autodata
Voltage, trigger box with engine idling	12...14 V max. 1 V less than U _B
Voltage, ignition coil with engine idling	equal to/greater than 10 V
Peak-coil-current cutout Ignition ON	After approx. 1 s 0 V
Primary voltage with engine idling	290...350 V
Refer to Autodata test specifications for settings as regards idle speed, exhaust, valve clearance etc.	

For production reasons:
continued on the following
coordinate.

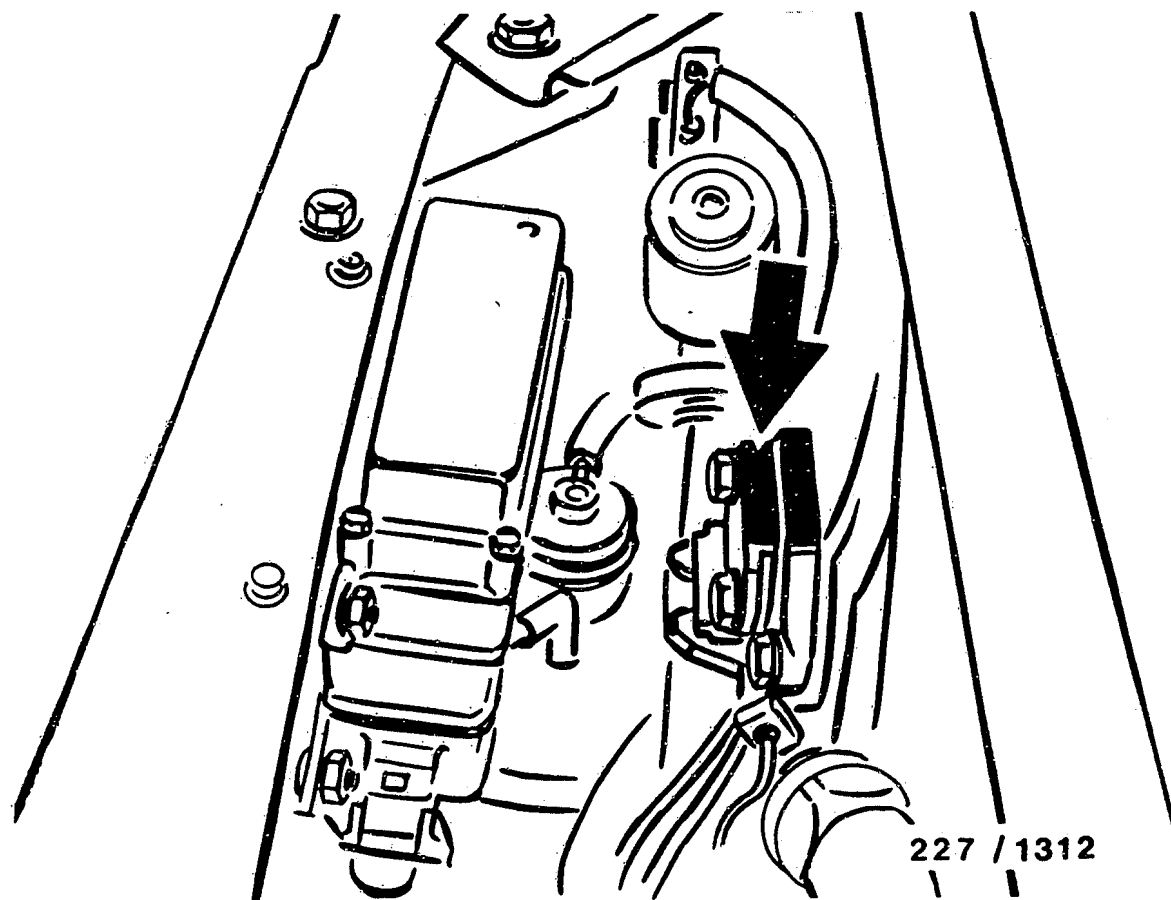


ELECTRICAL TERMINAL DIAGRAM

High-tension arrows: caution 400 V...25 kV

B1 = Magnetic pulse generator (ignition distributor)
 E1 = to ignition distributor
 T1 = Ignition coil

X1 = Trigger-box plug
 X2 = Ignition-pulse-booster plug
 X3 = to ignition test connection

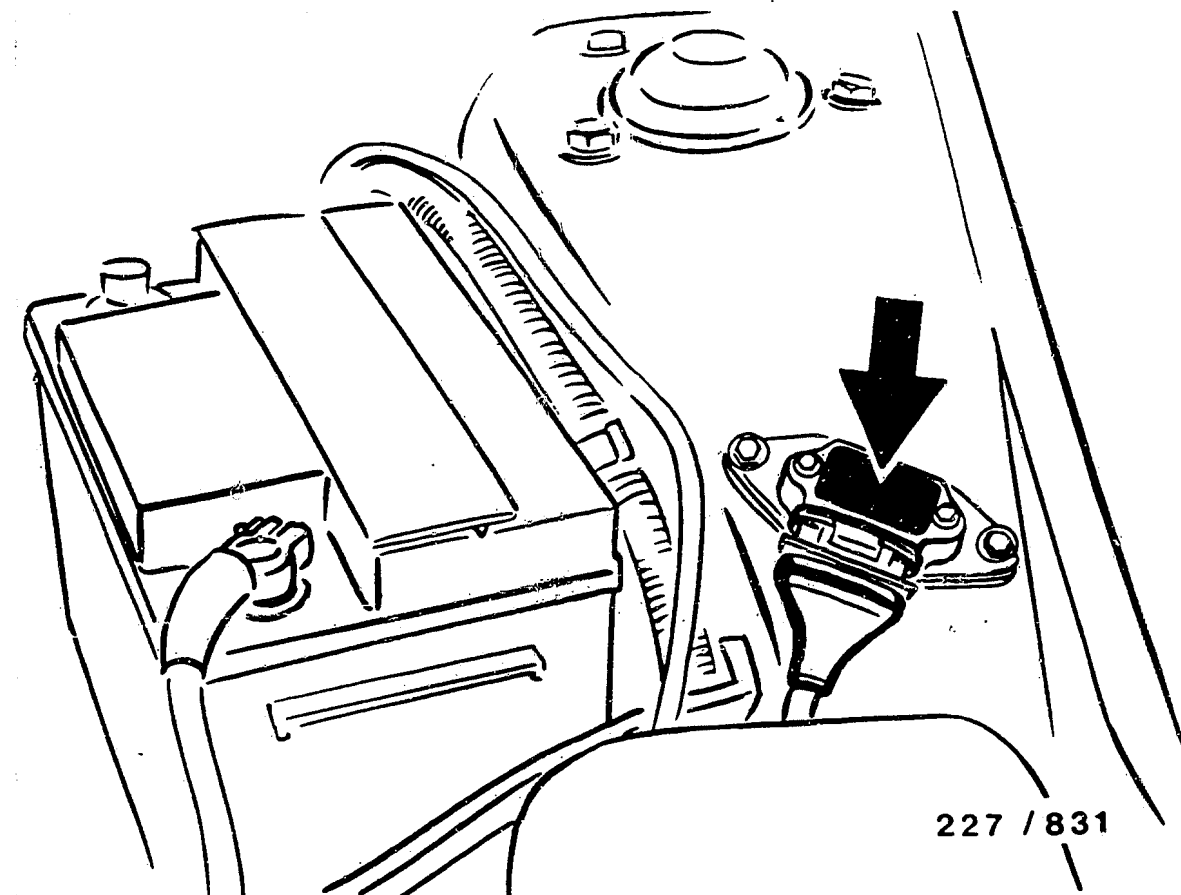


INSTALLATION POSITION OF COMPONENTS

Ignition trigger box:

Type of vehicle: Saab 900

The trigger box is located on a heat sink at the engine bulkhead next to the left-hand wheel house.

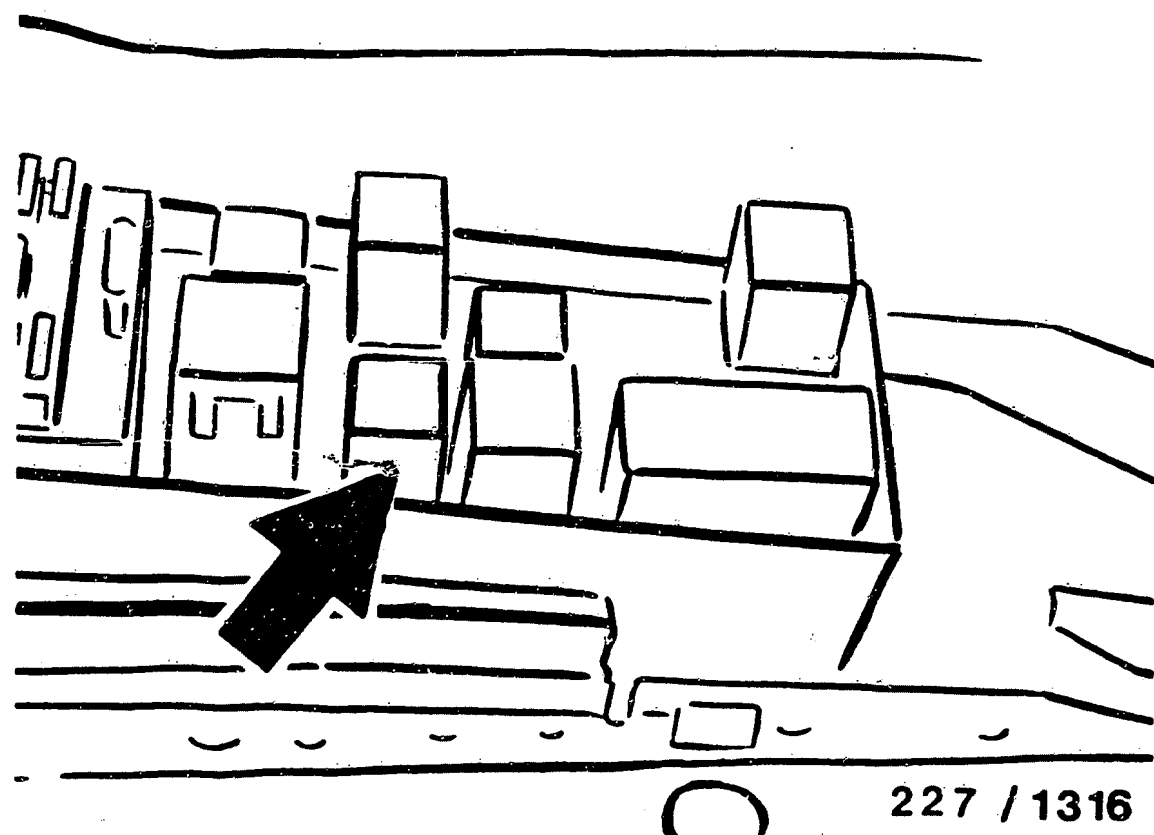


INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition trigger box:

Type of vehicle: Saab 9000

The trigger box is located on a heat sink at the left-hand wheel house.

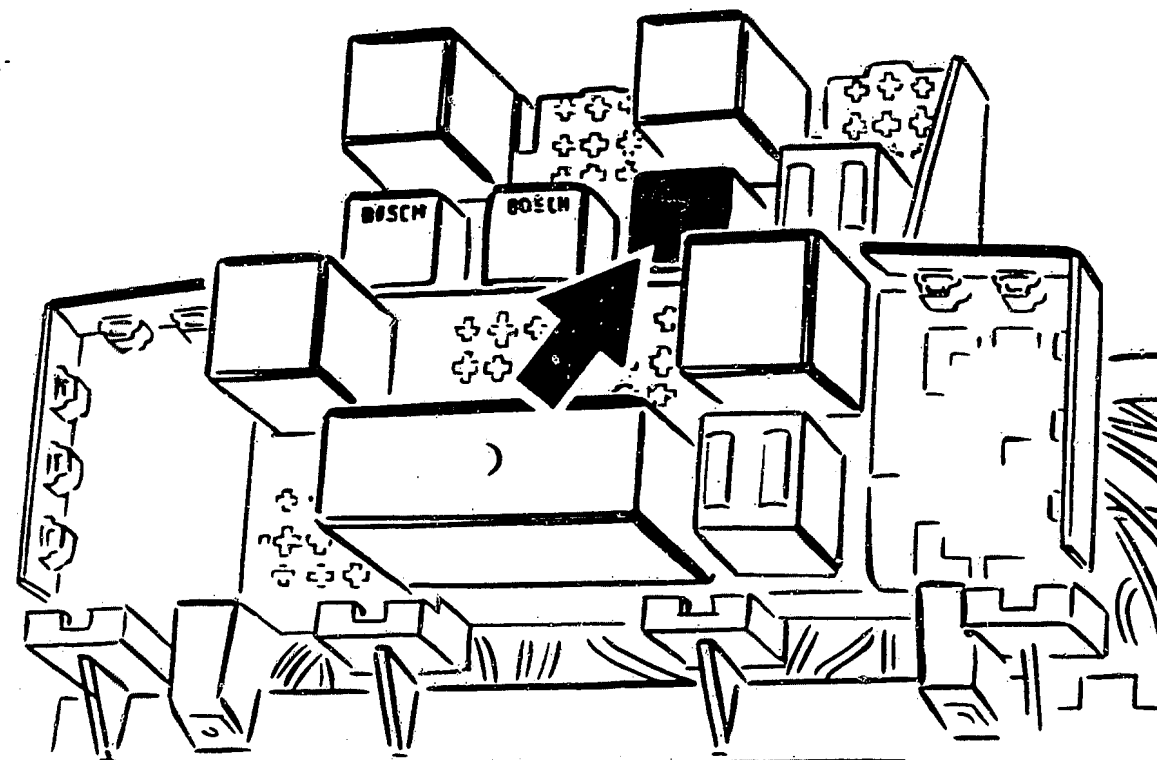


INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition-pulse booster:

Type of vehicle: Saab 900
Model years 1986 and 1987 only

The ignition-pulse booster is located in the central-electrics console on the left-hand wheel house at relay location D (arrow).

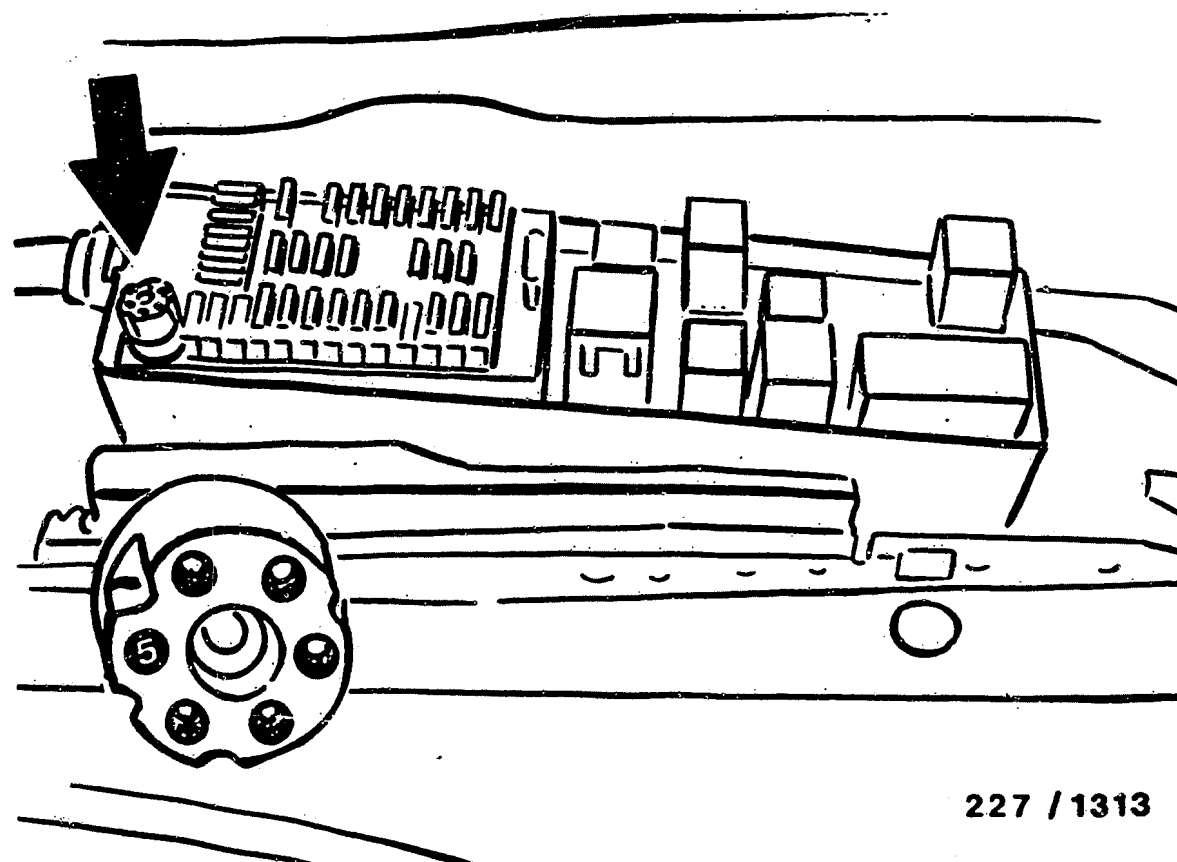


INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition-pulse booster:

Type of vehicle: Saab 9000
Model years 1986 and 1987 only

The ignition-pulse booster is located in the central-electrics console behind the glove compartment at relay location J (arrow).



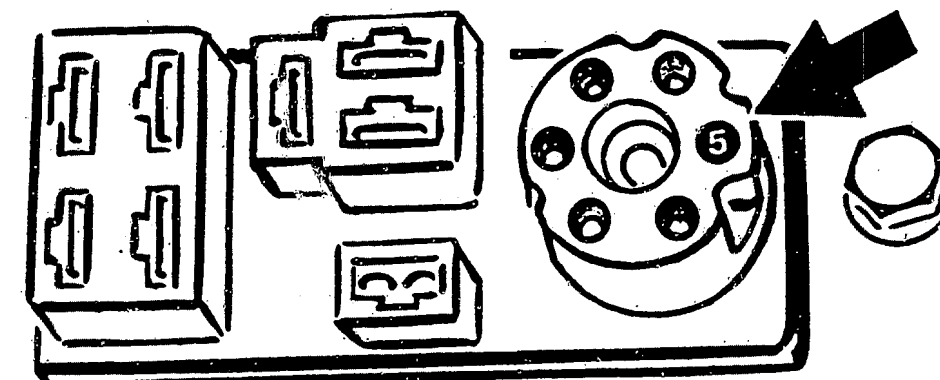
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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition test connection:

Type of vehicle: Saab 900

The ignition test connection is located in the central-electrics console on the left-hand wheel house. (Arrow, term. 5)



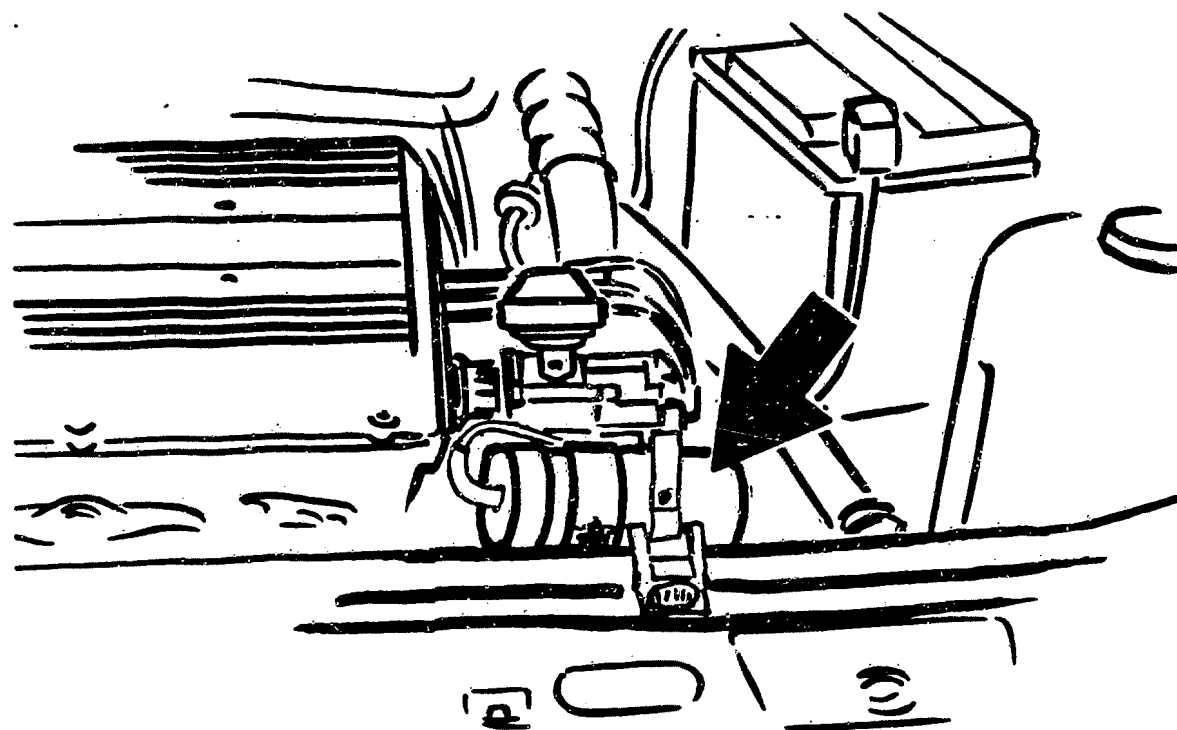
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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition test connection:

Type of vehicle: Saab 9000

The ignition test connection is located on the left-hand wheel house. (Arrow, term. 5)



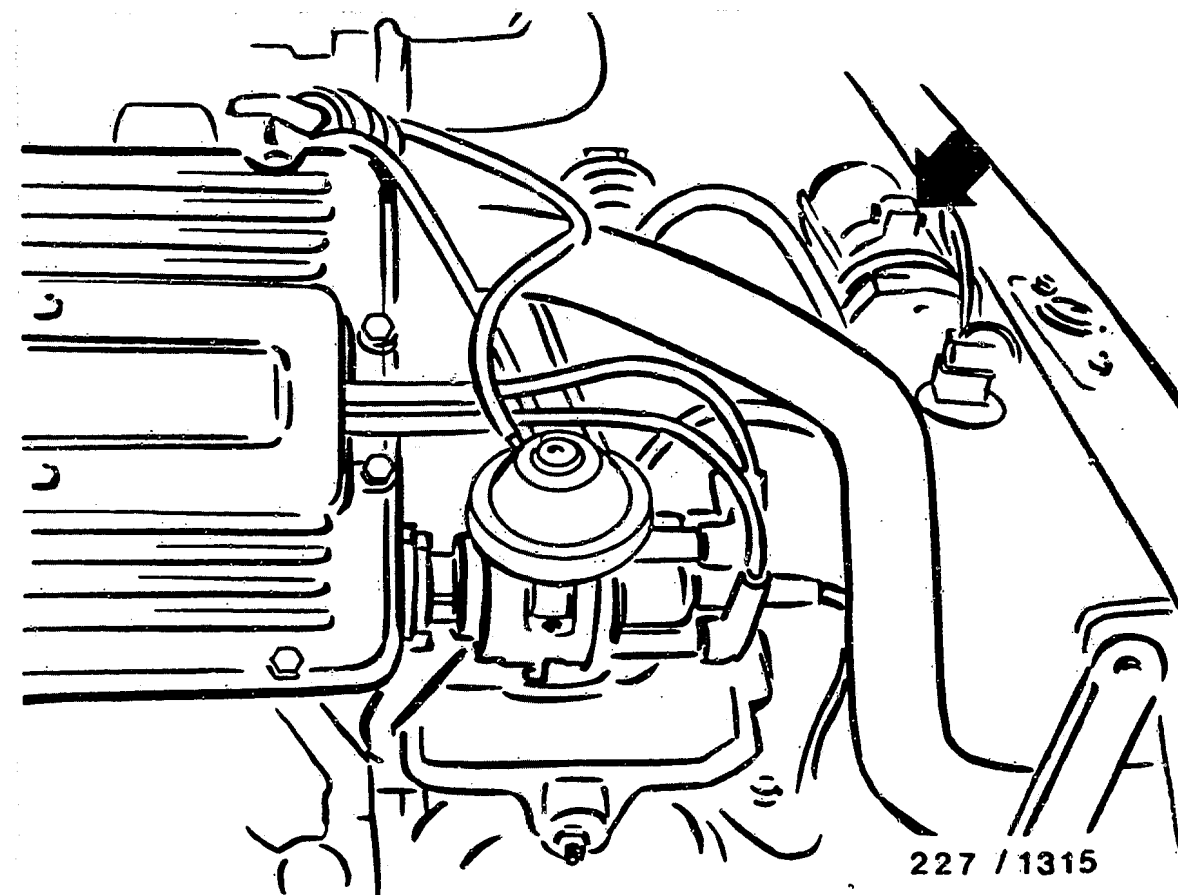
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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition coil:

Type of vehicle: Saab 9000

The ignition coil is attached above the radiator in the engine compartment (picture, arrow).



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INSTALLATION POSITION OF COMPONENTS (CONTINUED)

Ignition coil:

Type of vehicle: Saab 900

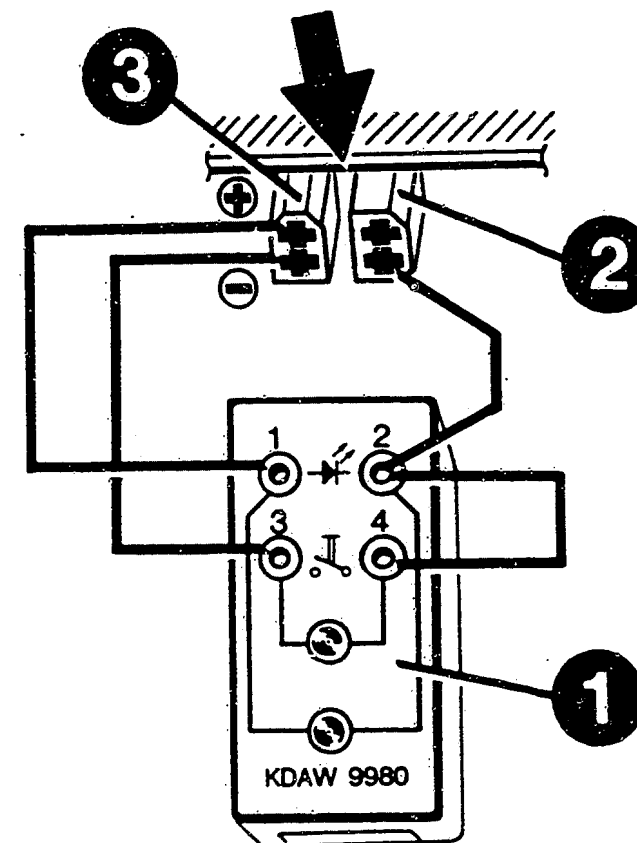
The ignition coil is attached above the radiator in the engine compartment (picture, arrow).

SPECIAL FEATURES (CONTINUED)

Attention is to be paid to the following items so as to avoid damage to the throttle-body injection unit.

(EU) The assignment screw (at the bottom of the throttle-plate lever) is not to be used for adjusting the idle speed. It serves to set the position of the throttle valve with respect to the throttle-valve positioner. This is only necessary when renewing the throttle-valve section or the throttle-valve positioner.

- * Do not turn stop screw (minimum stop) of throttle valve as otherwise the control unit detects a fault. Screw is permanently set and secured against being turned.
- * Do not actuate idle contact with throttle valve deflector (part and full-load range). This could cause the throttle-valve positioner to block.
- * Do not loosen screws of pressure regulator. Do not exert pressure on upper section, as this may alter the fuel pressure.
- * Do not adjust throttle-valve potentiometer. There is no service potential for checking assignment of throttle-valve position (angle) with respect to potentiometer.



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- 1 = Evaluation unit KDAW 9980
- 2 = Diagnosis plug connection (brown) *
- 3 = Diagnosis plug connection (black) *

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

A flashing-code indication is required for reading out the fault memory.

If no diagnosis lamp (LED) is provided in the instrument panel, use is to be made of the evaluation unit KDAW 9980.

The diagnosis sockets (black) * and (brown) * are located in the driver's footwell at the front in a recess beneath the cover.

Refer to picture for connection.

* = Colour may vary

SPECIAL FEATURES (CONTINUED)

Self-diagnosis

Test prerequisite:

- * Voltage supply of control unit O.K.
 Battery positive : to term.4,
 Positive of term. 15: to term.9,
 Ground : to term.5 and term.25.
- * Diagnosis lamp (LED) in dash panel insert (top picture) O.K.
 Positive of term. 15 : to diagnosis-lamp positive,
 ground to diagnosis lamp : from term. 22 of control unit.
- * Diagnosis contact at fuel pump relay (centre picture).

Fault storage takes place in the event of:

- * Test drive of at least 10 minutes duration or
- * if engine won't run, actuate starting motor for approx. 6 secs.
 Do not switch off ignition.

Activation of self-diagnosis:

- * Switch on ignition or allow engine to idle.
- * Jumper diagnosis contact at fuel pump relay for at least 5 seconds or connect diagnosis plug connection (brown) for at least 5 seconds to ground or press button on KDAW 9980.
 Diagnosis lamp starts to flash.

Readout of fault memory:

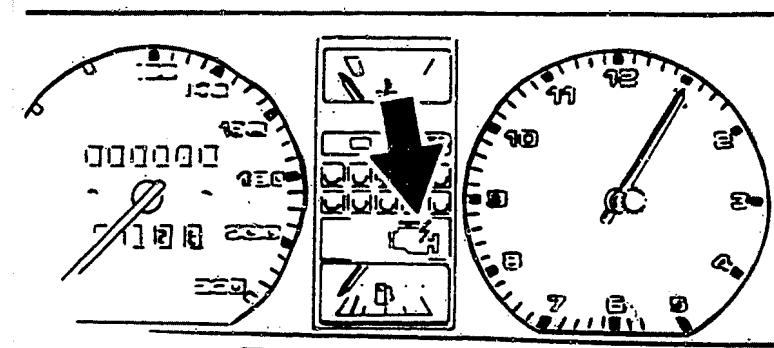
- * Each flashing code consists of 4 flashing-pulse groups.
 A flashing-pulse group contains 1, 2, 3 or 4 flashing pulses.
 There are pauses of approx. 2.5 s duration between the flashing-pulse groups. Several faults may have been stored. Only one fault can be stored with the control unit 0 280 000 716/.

Example: Pulse sequence || ||| |||| ||
 signifies flashing code 2 3 4 2

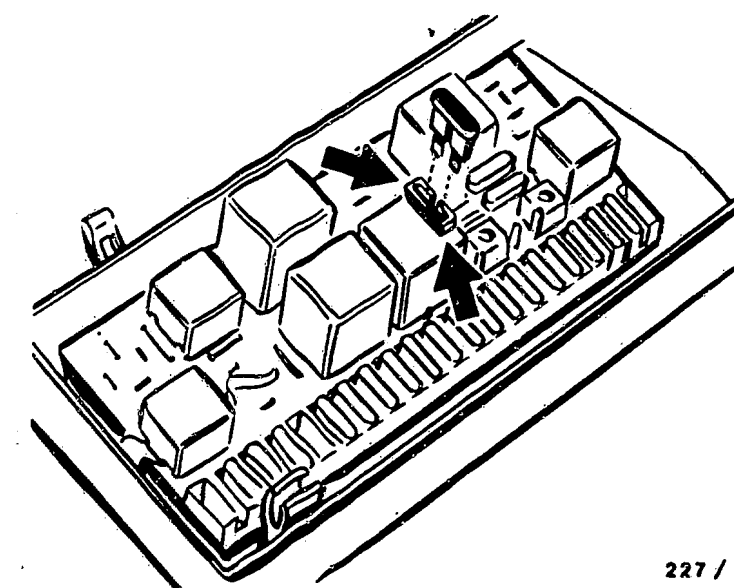
- * The flashing code is repeated until the ignition is switched off or until the engine speed is increased to in excess of 2500 min⁻¹

Clearing fault memory:

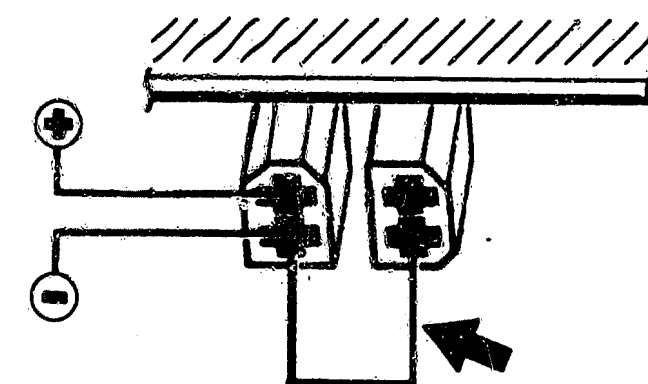
- * With ignition switched off, connect diagnosis plug connection (brown) to ground or press button on KDAW 9980.
- * Switch on ignition and - after at least 5 s - break ground connection or release button.



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STRUCTURE AND USAGE

These brief instructions encompass essentially vehicle-specific special features and test specifications (set values).

In accordance with the customer complaint, the trouble-shooting chart leads to different causes/component faults.
For a detailed description of trouble-shooting, see the information in the trouble-shooting chart of the basic instructions.

ATTENTION: Even if reference is made to basic instructions, the set values, terminal assignments and special features of these vehicle-related brief instructions are always binding.

Identical test-step numbering makes it easier to find individual test steps in the brief and basic instructions.

SAFETY AND PRECAUTIONARY MEASURES

In order to keep persons out of danger and to avoid damage to the engine, trigger boxes and control units or to the ignition system, observe the information in the basic instructions.

CAUTION!
High-performance ignition system with dangerous primary and secondary voltages!

Touching voltage-carrying components or terminals may prove fatal (both on the primary and secondary sides).

* Avoid injection of fuel when testing the compression.
To ensure this, disconnect pump relay.

For further precautionary measures, see brief instructions.

TROUBLE-SHOOTING CHART (CONTINUED)

Customer complaint (fault symptoms)

1. Starting motor operates, engine fails to start or starts only with difficulty.
2. Engine starts but then dies.
3. Idle problems (engine speed, exhaust gas).
4. Poor throttle take-up, flat spot during acceleration.
5. Engine missing (ignition, injection).
6. Maximum engine power/top speed not reached.
7. Fuel consumption too high.
8. Engine running on (dieseling).
9. Engine pinging/knocking.
10. Engine overheating.
11. Fault lamp.

Cause (component fault)										
*	*	*	*	*	*	*	*	*	*	Self-diagnosis
*	*	*	*	*	*	*	*	*	*	Universal test adapter
*	*	*	*	*	*	*	*	*	*	Air-intake system
				*	*	*	*	*	*	Fuel delivery
*	*	*	*	*	*	*	*	*	*	Fuel pressure, leaks
		*	*	*	*	*	*	*	*	Solenoid-operated injection valve
			*	*	*	*	*	*	*	Alternator, interference-suppress.
*	*	*	*	*	*	*	*	*	*	Start control
			*	*	*	*	*	*	*	Overrun cutoff
	*	*	*	*	*	*	*	*	*	Engine-speed, CO setting
	*	*	*	*	*	*	*	*	*	Lambda closed-loop control
				*	*	*	*	*	*	Exhaust-gas catalyt. converter
	*	*	*	*	*	*	*	*	*	Tank ventilation

SELF-DIAGNOSIS TEST TABLE

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values
1 1 1 1	Control unit	Replace control unit without further testing.	—	—
2 1 2 1	Idle contact	Assignment screw of throttle-plate lever must close idle contact. Check resistance directly at throttle-valve positioner. Throttle valve closed: Throttle valve open: Check following leads: from control-unit plug to throttle-valve-positioner idle contact and to ignition-timing valve, from idle contact to engine ground.	3 - 4 3 - 3 4-grd	0...0.5 Ω infinity Ω approx. 0 Ω approx. 0 Ω
2 1 2 2	No engine-speed signal	Check lead from control unit term. 1 to ignition trigger box term. 7. Check TD-rectangular signal with engine tester at control-unit plug term. 1. Check ignition system.	1 - 7 1 - 5	approx. 0 Ω Square-wave voltage min. 80 % U-battery
2 2 1 2	Throttle-valve potentiometer	Measure resistance value directly at throttle-valve potentiometer: Deflect throttle valve: Check leads from control unit to throttle-valve potentiometer: Lead from potentiometer to engine ground Short-circuit to + 5 V.	1 - 5 2 - 4 8 - 5 7 - 2 18 - 4 1-grd	600...1400 Ω 400...4000 Ω Maximum at part load approx. 0 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω
2 3 1 2	Temperature sensor (Engine)	Measure resistance value directly at temperature sensor: at ambient temperature +15...+30°C: with engine at operating temp. approx. +80°C: Check leads from control unit to temp. sensor (NTC).	2 -NTC NTC-grd grd-5	1.45...3.3 k Ω 280...360 Ω approx. 0 Ω approx. 0 Ω approx. 0 Ω

SELF-DIAGNOSIS TEST TABLE (CONTINUED)

Fault indication Flashing code	Testing of component/function	Test instructions/ Test conditions	Termi- nals	Set values
2 3 2 2	Temperature sensor (intake air)	Measure resistance value directly at quadruple plug: at ambient temperature +15...+30°C: at approx.+50°C: Check following leads: from control unit term. 14 to temp. sensor term. 1 from engine ground to temp. sensor term. 4	1 - 4 14 - 1 grd-4	1.45...3.3 k Ω 700 ...950 Ω approx. 0 Ω approx. 0 Ω
2 3 4 1	Lambda closed-loop control not within working range (control limits exceeded or undershot).	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Check sensor heater	20	1...15 Ω 8...15 V
2 3 4 3	Lambda closed-loop control has reached adaption limits.	Sensor ceramics clogged. Intake system leaking. Tank-ventilation valve permanently open. Injection valve defective, check Check fuel pressure	Resistance value: Supply voltage : Resistance value: Set value:	1.0...1.6 Ω see test specifications on diagram
2 3 4 2	Lambda sensor	Open circuit in sensor lead or short circuited to ground or battery voltage. Pay attention to worn insulation. Sensor ceramics clogged. Check sensor heater	20 Resistance value: Supply voltage :	1...15 Ω 8...15 V
4 4 3 1	Throttle-valve positioner	Measure resistance directly at quadruple plug : Check following leads: from control-unit plug term. 24 to positioner term.1 from control-unit plug term. 23 to positioner term.2 Control unit defective.	1 - 2 24 - 1 23 - 2	4...250 Ω approx. 0 Ω approx. 0 Ω
4 4 4 4	No fault stored	Continue trouble-shooting in accordance with trouble-shooting chart		
0 0 0 0	End of fault output	If necessary, continue trouble-shooting in accordance with trouble-shooting chart		

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01
 Adapter lead: 1 684 463 170

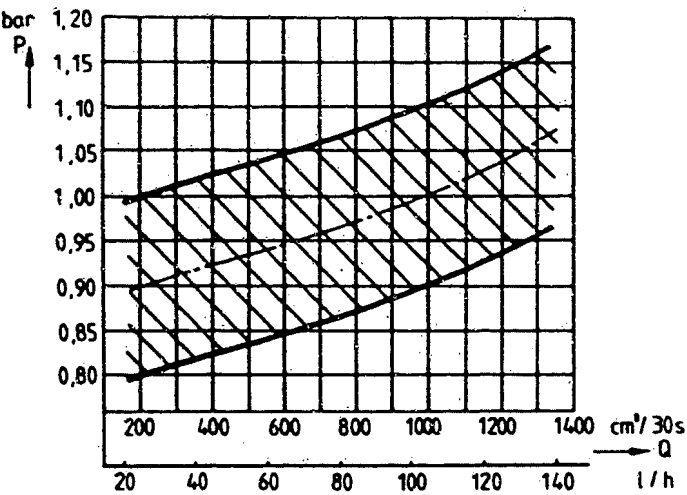
Test step	Switch V	Ω	Termi- nals	Testing of component/function	Test instructions/ test conditions	Set values
1	5	-	1 - 5 (+) (-)	TD-speed signal from ignition trigger box term. 7	Transmission in neutral, start	Square-wave voltage min. 80% U-bat.
2	6	-	4 - 5 (+) (-)	Voltage supply of control unit		8...15 V
3	7	-	9 - 5 (+) (-)	Voltage supply via ignition term. 15	Switch on ignition	8...15 V
4	8	-	17 - 5 (+) (-)	Simulated actuation of electric fuel pump	Switch on ignition Press button 3	Electric fuel pump runs, check by listening
5	8	-	17 - 5 (+) (-)	Pump relay	Switch on ignition	8...15 V
6	9	-	15 - 5 (+) (-)	A/C readiness (if provided)	Ignition "on", switch on A/C	8...15 V
7	10	-	16 - 5 (+) (-)	A/C compressor (if provided)	Ignition "on", switch on A/C	8...15 V
8	12	-	12 - 5 (+) (-)	Tank-ventilation frequency valve	Switch on ignition Press button 4	Frequency valve must be energized, check by listening
9	13	-	3 - 5 (+) (-)	Ignition-timing valve	Switch on ignition Depress accelerator pedal somewhat	8...15 V
10	 V	5	22 - 5	Diagnosis lamp (LED) (if provided)	Press button 1	Diagnosis lamp lights up
11	 V	7	3 - 5	Throttle-valve positioner Idle contact	Detach plug of ignition-timing valve. Accelerator pedal in off-position ; Depress accelerator pedal somewhat ; Attach plug to ignition-timing valve.	0...10 Ω infinity Ω

RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER ETT 018.01 (continued)
 Adapter lead : 1 684 463 170

Test step	Switch V	Ω	Termi- nals	Testing of component/function	Test instructions/Test conditions	Set values
12	 V	8	6 - 5	Ground connection (transmission switch)	Ignition "OFF", manual transmission arbitrary, automatic P/N : automatic Drive:	0...10 Ω infinity Ω
13	-	-	-	not applicable		
14	 V	10	11 - 5	Pump-encoding connection		0...10 Ω
15	 V	11	14 - 5	Temperature sensor (intake air)	Ambient temperature +15...30 °C : at approx.+50°C:	1.45...3.3 k Ω 700 ...950 Ω
16	 V	12	2 - 5	Temperature sensor (engine)	Ambient temperature +15...30 °C : Engine at operating temperature approx. +80 °C :	1.45...3.3 k Ω 280...360 Ω
17	 V	13	25 - 5	Ground connection Output stage		0...10 Ω
18	 V	14	13 - 5	Solenoid-operated in- jection valve and series resistor		6...12 Ω
19	 V	15	8 - 5	Throttle-valve potentiometer		600...1400 Ω
20	 V	16	7 - 18	Throttle-valve potentiometer	Deflect throttle valve (Maximum value at part load)	400...4000 Ω
21	 V	20	23 - 24	Throttle-valve positioner		4...250 Ω

TEST SPECIFICATIONS

Component/function	Set values
Electric fuel pump	
* Delivery at return:	min. 650 cm ³ /30s
* Supply voltage under load:	min. 12 V
Pressure regulator	
* Fuel pressure with engine stopped:	see diagram
Solenoid-operated injection valve	
* Internal resistance between term. 2 and term. 3 at ambient temperature +15...+30 °C :	1,0...1,6 Ω
* Leakage after 60 s:	a maximum of 1 droplet may drip off
Resistance lead for injection valve	
* Internal resistance:	1...2,5 Ω
Throttle-valve potentiometer	
* Internal resistance between term. 5 and term. 1 :	600...1400 Ω
term. 4 and term. 2:	400...4000 Ω
Deflect throttle valve (Max. value at part load)	
Throttle-valve potentiometer	
* Internal resistance between term. 1 and term. 2 :	4...250 Ω
* Idle contact term. 3 and term. 4 :	0...0,5 Ω
Lambda sensor heater	
* Internal resistance (PTC) with engine stopped:	1... 15 Ω



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Q = Fuel delivery of electric fuel pump
 p = Primary pressure

TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Temperature sensor (engine)

* Internal resistance at ambient temperature +15...+30 °C :	1,45...3,3 k Ω
with engine at operating temp. approx. +80 °C :	280...360 Ω

Temperature sensor (intake air)

* Internal resistance between term. 1 and term. 4 at ambient temperature +15...+30 °C :	1,45...3,3 k Ω
at approx. +50°C :	700...950 Ω

Tank-ventilation frequency valve and tank-ventilation switching valve

* Internal resistance at ambient temperature +15...+30 °C :	35... 55 Ω
---	-------------------

Start control

* Voltage at injection valve Start initiation :	greater than 1,0 V
after approx. 15s:	approx. 0,3 V

Idle

Engine at operating temperature, approx. +80°C	
* Idle speed:	750...950 min $^{-1}$
* Lambda sensor voltage	
Emissions "lean":	0,05...0,3 V
Emissions "rich":	0,6 ...1,0 V
Idle speed and lambda closed-loop control cannot be adjusted (adaptive control)	

TEST SPECIFICATIONS (continued)

Component/function	Set values
--------------------	------------

Closing damper

(manual transmission only)	
* Press-in travel of plunger, moved by throttle-plate lever:	4,0...4,5 mm

Intake-manifold preheater (hedgehog)

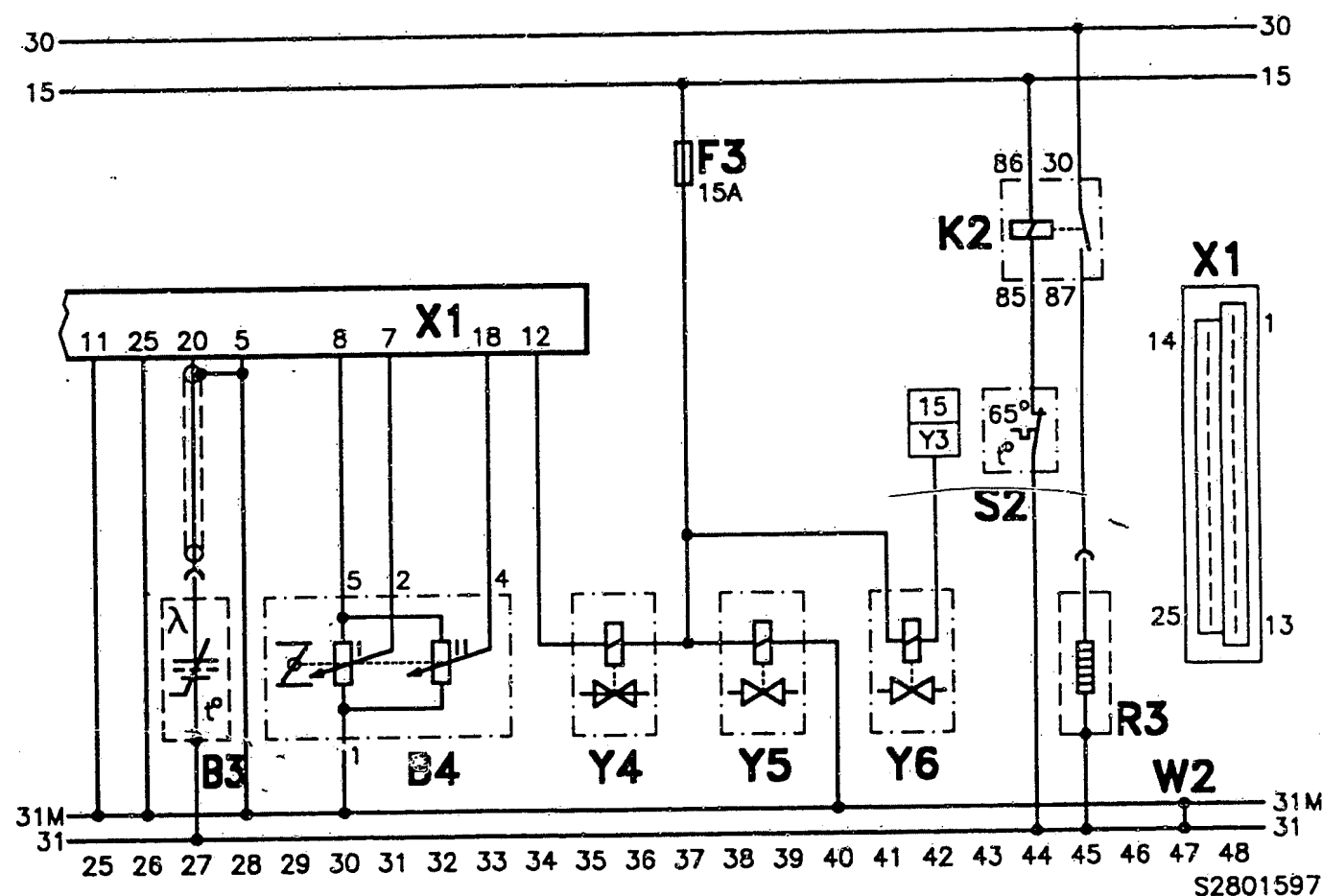
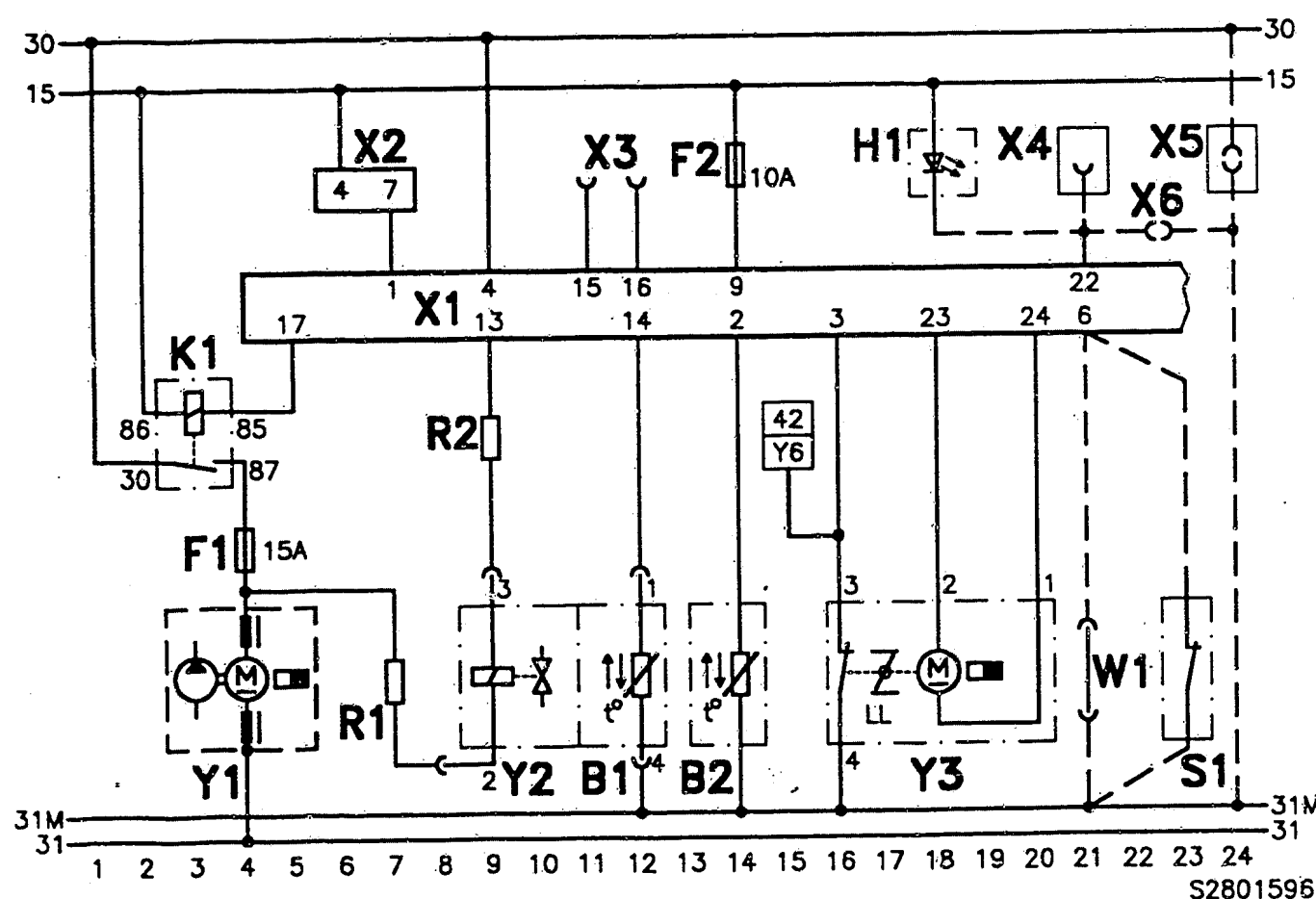
* Internal resistance between plug and ground with engine cold:	0,25...0,5 Ω
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Thermoswitch (red)

for intake-manifold preheater

* Internal resistance less than 55°C:	approx. 0 Ω
above 65°C:	infinity Ω

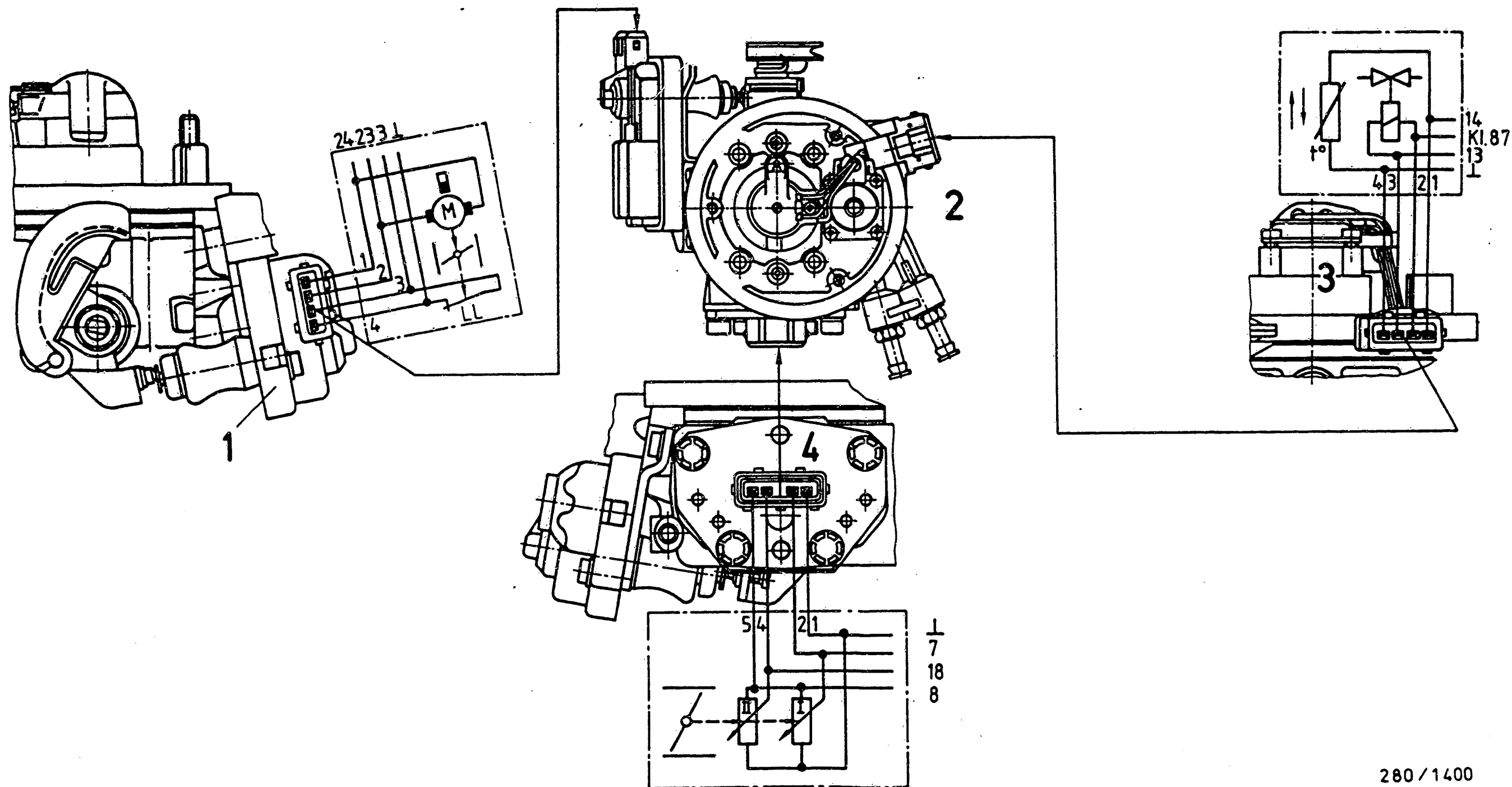
Refer to equipment and Autodata microcard for settings as regards ignition, valve clearance and other engine-related data



ELECTRICAL TERMINAL DIAGRAM

B1 = Temperature sensor (intake air)
 B2 = Temperature sensor (engine)
 B3 = Lambda sensor
 B4 = Throttle-valve potentiometer
 F1 = Fuse (fuel pump)
 F2 = Fuse
 F3 = Fuse
 H1 = Diagnosis lamp (up to 7.88)
 K1 = Pump relay
 K2 = Relay, intake-manif. preheater
 R1 = Resistance lead
 R2 = Resistance lead
 R3 = Intake-manifold preheater
 S1 = Drive switch (automatic transmission only)
 S2 = Thermostwitch
 W1 = Jumper (manual transmission only)
 W2 = Ground strap, engine
 X1 = Control-unit plug, Monojet.
 X2 = Control-unit plug, ignition
 X3 = Plug for A/C
 X4 = Diagnosis plug connection (brown) (as of 8.88)
 X5 = Diagnosis plug connection (black) (as of 8.88)

X6 = Diagnosis contact at pump relay (up to 7.88)
 Y1 = Electric fuel pump
 Y2 = Solenoid-operated injection valve
 Y3 = Throttle-valve positioner
 Y4 = Tank-ventilation frequency valve
 Y5 = Tank-ventilation switching valve
 Y6 = Ignition-timing valve

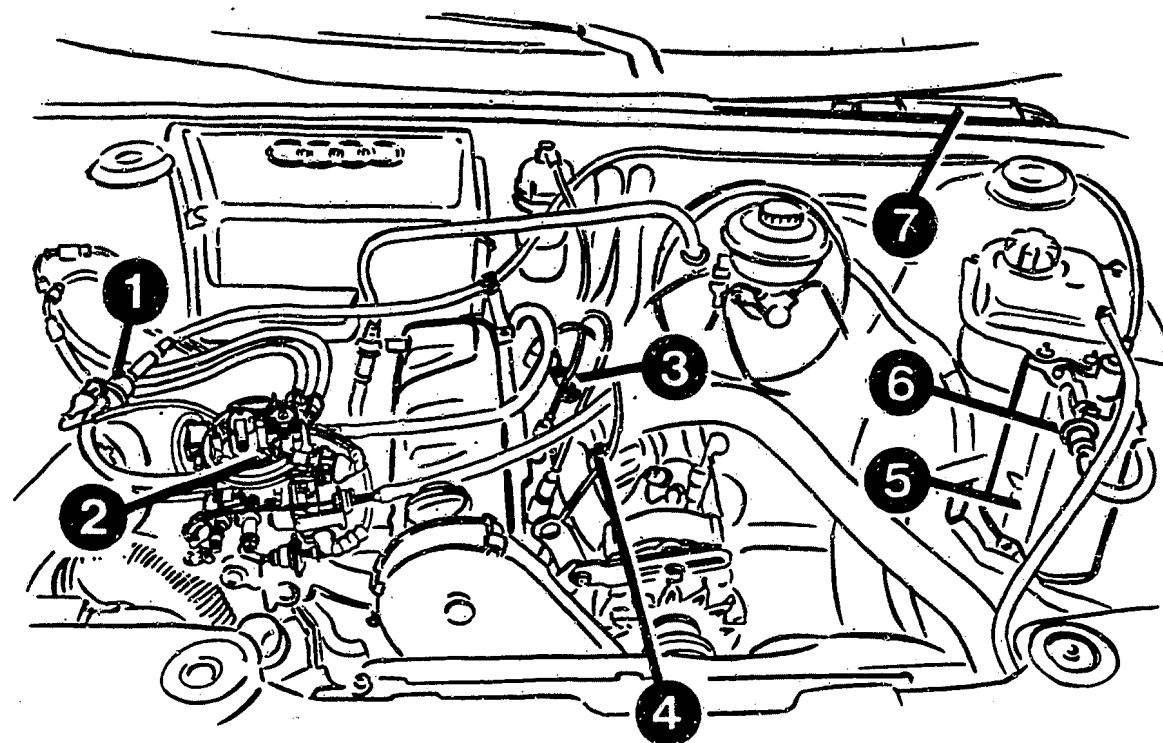


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PLUG ASSIGNMENT OF THROTTLE-BODY INJECTION UNIT

- 1 = Throttle-valve positioner
with idle contact
- 2 = Throttle-body injection unit

- 3 = Solenoid-operated injection valve
and temperature sensor (intake air)
- 4 = Throttle-valve potentiometer



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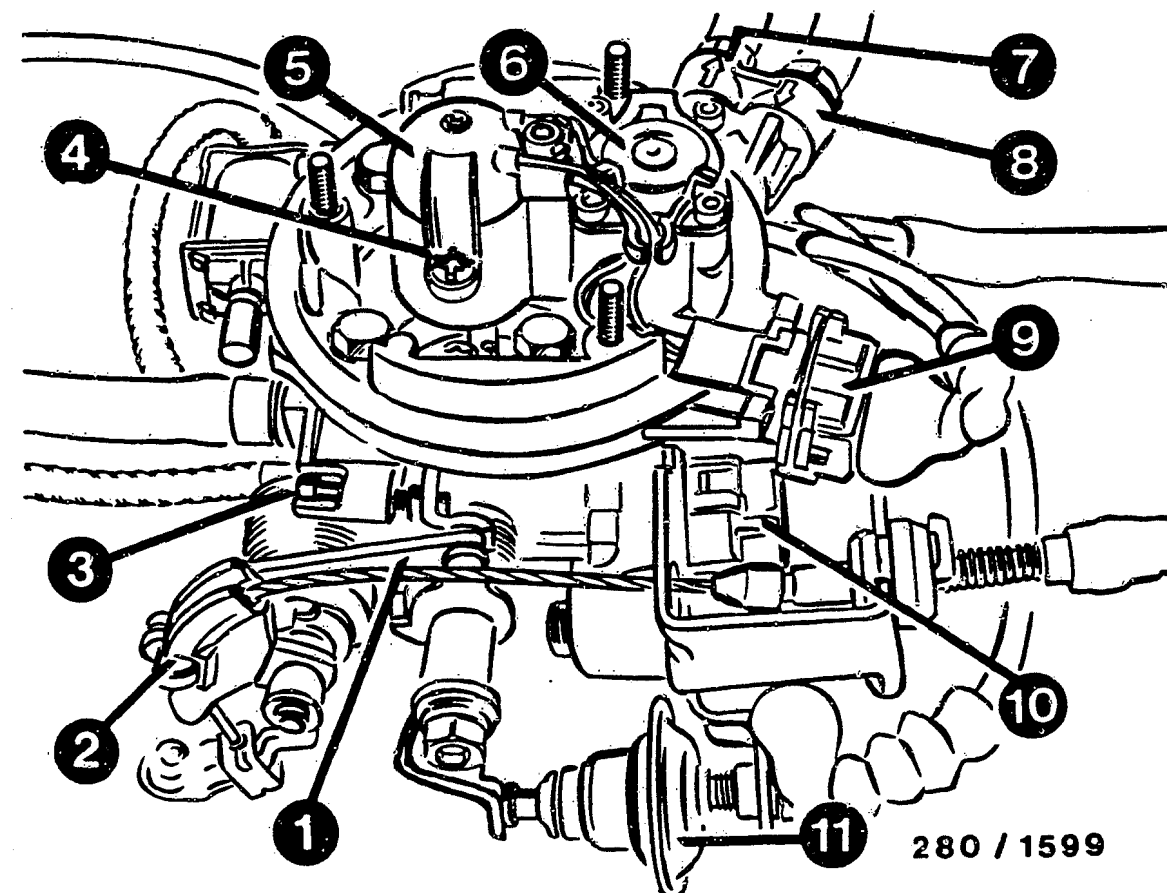
- 1 = Tank-ventilation switching valve
- 2 = Throttle-body injection unit
- 3 = Thermoswitch for intake-manifold preheating
- 4 = Temperature sensor (engine)
- 5 = Active-carbon container
- 6 = Tank-ventilation frequency valve
- 7 = Relay holder with fuse holder

INSTALLATION POSITION OF COMPONENTS

The pictures refer to the AUDI 80

All installation locations relate to the direction of travel.

Arrangement of components in engine compartment.



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- 1 = 4-bar linkage to throttle-plate lever
- 2 = Pulley
- 3 = Secured stop screw (minimum stop)
- 4 = Temperature sensor (intake air)
- 5 = Solenoid-operated injection valve
- 6 = Pressure regulator
- 7 = Fuel return
- 8 = Fuel inlet
- 9 = Quadruple plug for injection valve and temperature sensor (intake air)
- 10 = Throttle-valve positioner
- 11 = Closing damper

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

The electric fuel pump and fuel filter are located on the bottom of the vehicle ahead of the rear axle

The lambda sensor is installed in the exhaust manifold.

INSTALLATION POSITION OF COMPONENTS (CONTINUED)

* Top picture

Arrow = Tank-ventilation switching valve

* Centre picture

1 = Tank-ventilation frequency valve

2 = Active-carbon container

* Bottom picture

1 = Ignition-timing valve

2 = Plug connection for throttle-valve potentiometer

3 = Fuel return

4 = Fuel inlet

5 = Pressure regulator

6 = Plug for injection valve and temperature sensor
(intake air)

Further installation positions

- * The sensor plug connection is located at the right-hand spring-strut dome at the front.
- * The pump relay of the safety circuit is to be found at relay location 10 on the relay board in the plenum chamber on the left.
- * The relay for the intake-manifold preheater is to be found at relay location 11 on the auxiliary relay holder in the driver's footwell beneath the instrument panel.
- * The diagnosis lamp (up to 7.88) is located in the dash panel insert.
- * The diagnosis contact (up to 7.88) is located on the pump relay.
- * The diagnosis plug connections (black) and (brown) are located (as of 8.88) in the driver's footwell at the front in a recess beneath the cover.
- * The control unit is located in the passenger-side footwell beneath the glove compartment.
- * The ground connection for the injection is located at the intake manifold in the vicinity of cylinder no. 1.
- * The ignition control unit is located on the left in the driver's footwell beneath the plastic facing.

